Book review of " Giuseppina Pellegrino and Alessandro Mongili (eds.) Information Infrastructure(s): Boundaries, Ecologies, Multiplicity, Cam- bridge, Cambridge Scholars Publishing, 2014, pp. 337"

Timan, Tjerk

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

TECNOSCIENZA

Italian Journal of Science & Technology Studies

ISSN 2038-3460

2/2016

DOUBLE SPECIAL ISSUE - Part Two

Digital Circulation: Media, Materiality, Infrastructures

Velocipedia by Gianluca Gimini (Italy)

There is a quite funny story behind this project. It all started in 2009 in a bar in Bologna where I was chatting with a friend. We were talking about school time memories and I recalled this very embarrassing moment: a classmate was being questioned by our technical ed. teacher. He was doing pretty bad and was on the verge of tears at a certain point, so the teacher tried to help him out by asking him to describe his bicycle. The poor kid panicked and couldn't even remember if the driving wheel was the front or the rear one. My friend laughed at this story and said that anyone who has ridden a bike must know how it's made. Then he tried drawing one on a napkin and miserably failed. That's the day I started collecting bike drawings.

I would walk up to friends, family or total strangers with a pen and a sheet of paper in my hand, asking that they immediately draw me a men's bicycle, by heart. Soon I found out that when confronted with this odd request most people have a very hard time remembering exactly how a bike is made. Some did get close, some actually nailed it perfectly, but most ended up drawing something that was pretty far off from a regular men's bicycle.

I collected hundreds of drawings. There is an incredible diversity of new typologies emerging from these crowd-sourced and technically error-driven drawings. A single designer could not invent so many new bike designs in 100 lifetimes and this is why I look at this collection in such awe.

In 2016 I eventually decided it was my turn to take part in this project. I selected those sketches that I found most interesting, genuine and diverse, then rendered them in digital form as if they were real. I became the executor of these two minute projects by people who were mainly non-designers and confirmed my suspicion: everyone, regardless his age and job, can come up with extraordinary, wild, new and at times brilliant inventions.

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Tecnoscienza is promoted by **STS Italia** (www.stsitalia.org)
The Italian Society for the Study of Science and Technology
Tecnoscienza c/o STS Italia, Via Carducci, 32 – 20123, Milano – Italy
www.tecnoscienza.net – redazione@tecnoscienza.net – ISSN 2038-346

TECNOSCIENZA

Italian Journal of Science & Technology Studies

Vol. 7, Nr. 2, December 2016

Cover *Velocipedia* by Gianluca Gimini

Double Special Issue – Part Two

Digital Circulation: Media, Materiality, Infrastructures

Edited By Gabriele Balbi, Alessandro Delfanti and Paolo Magaudda

Guest Editors' Introduction

Lecture

Essays

A Second Round of Digital Circulation

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Abstract: This introduction provides an overview of the articles included in the second part of the special issue on 'digital circulation', whose first portion has been published in the previous issue of the Journal (1/2016). In doing so, the authors reconnect the content of this issue with the theoretical and empirical insights developed in the introduction that accompanied the first part.

Keywords: Digital circulation; media; communication; infrastructures; data flow.

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This issue of *Tecnoscienza* is the second part of a special series analysing 'digital circulation' that completes the issue that was published in July 2016 (*Tecnoscienza* 1/2016). The concept of 'circulation' is emerging as a central concern in both digital media studies and science and technology studies. In this issue, we stress the need to cross-pollinate these two fields through approaches that address the interrelationship between the cultural and technological transformations that underlie digital circulation. Studying digital objects as they travel through space, time, and social spheres requires a close analysis of their cultural and political significance. Digital circulation produces meanings, responds to social and cultural needs, and shapes different social worlds. However, while this second part presents articles that mainly move away from analysis of the material infrastructures that underlie digital circulation, we aim to keep technology at the core of our work. In our original introduction that was published within the first part of the double special issue, we provided an initial theoretical framework for the study of digital circulation in science & technology studies and media studies (Balbi, Delfanti and Magaudda 2016). Referring to the work of Appadurai, we emphasized the need to identify the patterns of circulation and techno-political regimes that sus-

tain and create the life trajectories of digital objects; additionally, we argued for a multifaceted understanding of their specific and material biographies – their 'social lives'. This cannot be separated from a theoretically grounded grasp of the technological and material levels that constitute digital circulation.

In this second part, we present a series of studies that complement the first set of articles by insisting upon the lively cultural and political significance of digital circulation in diverse areas, such as mapping, television, youth and social media, and sexuality. Articles in this issue thus expand the empirical base for the development of understanding digital circulation while simultaneously converging in the production of a shared approach to examining the complex relationship between digital technology studies and theories of circulation. To align with the rhetorical use of the circulation framework as presented in our original introduction, we stress that the new articles published in this issue also explore and expand the circulation of ideas among STS, media and communication studies as well as other relevant fields.

This second issue on digital circulation begins with a "lecture" by Amade M'charek entitled *Performative circulations: On flows and stops in forensic DNA practices*. During the assembly of these two special issues, we discovered that the work of M'charek was surprisingly aligned with our own work. Therefore, we invited her to present her reflections on the relevance of the notion of 'circulation' in the anthropology of science. More specifically, M'charek focuses on 'circulation' as a framework to investigate the way that DNA currently is constantly travelling from the domain of scientific laboratories to the realm of the social world and vice versa. In doing so, she shows that the process of circulation is not only a way to examine how society and genetics relate to one another but also the actual generator of the contexts in which DNA's meanings and identities are constantly transformed and reconfigured.

After this opening lecture, the special issue presents five essays that contribute by elaborating upon and fostering the notion of circulation in relation to different empirical contexts and theoretical frameworks.

In *Disciplining Change, Displacing Frictions. Two Structural Dimensions of Digital Circulation across Land Registry Database Integration*, Annalisa Pelizza addresses the notion of circulation by focussing on crucial issues in digital infrastructures, particularly frictions and resistances in the circulation of data between different databases. The author borrows concepts from semiotics to problematize infrastructures and standards that are involved in the database management of an institutional infrastructure in the Netherlands, thereby offering new insights into the understanding of data circulation and, more specifically, how data circulation resists being regulated by standard procedures.

In *Liquefying Social Capital. On the Bio-Politics of Digital Circulation in a Palestinian Refugee Camp*, Monika Halkort describes the material political effects of data circulation in the context of a refugee camp in

Lebanon. The construction of spatial and social information about the camp through the generation and circulation of speculative digital data is interwoven with entrenched social knowledge and documentary evidence, which shifts the balance of power within the camp. The conversion of lived and embodied memory into data-informed forms makes claims of land ownership visible and effective while simultaneously restricting individual and collective life opportunities. The 'probabilistic' nature of geographical data is thus involved in the transformation of collective memory into a tradable asset.

The article written by Cosimo Marco Scarcelli and Claudio Riva is the first of three contributions that are explicitly focussed on the use of digital media and how media appropriation in itself is at the centre of different circulation processes. Hence, in *Digital Literacy Circulation: Adolescents and Flows of Knowledge about New Media*, Scarcelli and Riva address the process of appropriation of the Internet by Italian adolescents, examining how competencies that are involved in its use circulate and are reproduced among new generations. By addressing four different kinds of flows of these competencies, which emerge from their empirical research, the authors show that the appropriation of digital media can be understood as a multi-layered circulation of competencies that is much more complex and stratified than the vision offered by the notion of the 'digital divide'.

Alberto Marinelli and Romana Andò, in their paper entitled *From Linearity to Circulation: How TV Flow is Changing in Networked Media Space*, focus on a key concept of television studies: 'flow'. They claim that this powerful idea, which was first analysed by Raymond Williams in the 1970s, is now changing directions from a producer-controlled phase to a user-controlled phase. Due to the multiplication of screens and possibilities of consumption as well as new forms of digital interactivity between broadcasters and audiences, the authors claim that TV contents are changing their classic models of circulation. Specifically, audiences can now rephrase and control content, especially through social media. This theoretical hypothesis is corroborated through unpublished data from the Osservatorio Social TV 2015 research project that examined Italian TV audiences' consumption practices.

Finally, the article by Renato Stella entitled *Circulation of Technology, Circulation of Desire. Cybersex and the 'Sadian Collective Intellectual'* offers an additional contribution by reflecting on the notion of circulation by presenting an analysis that is based on his ethnographic empirical research on extreme online sexual activities. Borrowing from authors such as Akim Bay and Pierre Levy, Stella elaborates upon the concept of the 'Sadian collective intellectual' to address the logic of the circulation of extreme sexual narratives and imaginaries over the Internet. He also traces their evolution from the libertine sexuality presented in novels by Marquis de Sade to contemporary forms of online sexual interactions and cybersex practices.

Combined with the contributions that were published in the previous special issue, these articles further contribute by reflecting on the notion of 'circulation' and also by expanding the same process of the circulation of concepts and approaches among STS, media studies and other branches of social research.

References

Balbi, G., Delfanti, A. and Magaudda, P. (2016) *Digital Circulation: Media, Materiality, Infrastructures. An Introduction*" in "Tecnoscienza: Italian Journal of Science & Technology Studies", 7 (1), 7-16.

Performative Circulations: On Flows and Stops in Forensic DNA Practices

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Abstract: The article focuses on circulations and what circulations bring about. It does so by following the movements of DNA through different domains of forensic practice. By zooming in on DNA and the role it came to play in the Dutch Marianne Vaatstra case, the paper demonstrates the performative work of circulations and invites to attend empirically to circulations as an object of research. The article is organized along three steps, in which it is argued that: circulations bring about identities; that circulations make context; circulations are permanent and can only be stopped actively. In the analysis, circulation is no longer to be understood as a process of transmission, as a simple movement of people, commodities, or ideas from one place to another. Rather, the conclusion invites to attend to circulation as a performative event. An event that co-shapes not only humans and things as they move through space and time, but also the contexts in which this happen in situated manners.

Keywords: DNA; forensics; circulation; anthropology of science; genetics.

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In November 2012, no, to be precise, on Monday 19 November at 5.38 hours in the morning the well-known Dutch crime reporter Peter R. de Vries sent out the following tweet.

> CASE #VAATSTRA: Man arrested. White suspect, Frisian, lived 2.5 km from crime scene. 100 percent DNA-match! — Peter R. de Vries.[1]

[1] See for example this news report on the website of *NRC Handelsblad*: (http://www.nrc.nl/nieuws/2012/11/19/arrestatie-in-zaak-vaatstra-dna-match-bij-bekende-van-familie/). See also the follow up tweet by De Vries: *'Breaking news: white man (44) arrested for murder #vaatstra! 100 percent DNA-match! Hurray!*

This message was picked up by the media immediately and it is not hard to understand that the content came to entertain the minds of many people. Now, the fact that this message was going around so quickly is not the most interesting aspect of the theme of circulations, the topic of this address[2]. For, let us have a look at this message and what it draws together. There is: *genetics* in the form of DNA; *identity* for there is a 100% match; *race* since it spoke of a white suspect; *ethnicity* this suspect is also Frisian; social evils namely a serious crime; but also *media*, old and new: after all it is about a *television* reporter using *twitter*; the technology to send, receive and read twitter; and much more.

This *knot* suggests that our tendency to perceive the world as well-ordered, where science and society have and know their designated places, does not hold true in practice[3]. It is precisely this knot, and the various compositions thereof, that constitutes an interesting challenge to an anthropology of science. Circulations, as I want to show here, bring about and maintain such knots[4].

It was already in the early eighties that Donna Haraway introduced the Cyborg concept, a mixture of man and machine, to indicate that these knot-like manifestations do not only concern the things around us, but also ourselves (Haraway 1991). In her *Cyborg Manifesto* she pointed at the inextricable relation between nature and culture, between humans and technology. Her manifest was especially aimed at feminist colleagues and

Hurray! Hurray!!' (See in Dutch on Twitter: https://twitter.com/PeterRdeV-/status/270377910760771584).

[2] This text is a slightly revised version of my inaugural lecture delivered on Friday 18 September 2015 on the acceptance of the position of Professor in the Anthropology of Science. In the Netherlands these inaugural lectures are a particular genre. They cater for a wide and diverse public, they have to be somehow innovative but also accessible, scholarly but entertaining, reporting on research but also agenda setting. An almost impossible task. A nice tradition is that such lectures reserve ample space to thank colleagues and friends for the help, conversations and inspirations along the way. These words of thank are unfortunately not included in this text, but they are there in the original; (https://www.academia.edu/26836606/_Circulations_a_new_object_for_an_anthropology_of_science_Inaugural_address_Amade_Mcharek_September_18_2015_).

[3] The division between science and society is reflected in a commonly heard expression used by scientists when they are reminded of the societal effects of knowledge and technologies: "we deliver the facts and the tools and it is up to society to decide whether and how to use these." However, the political impact of this division cannot to be underestimated.

[4] For an inspiration on knots and threads see *Donna Haraway Reads the National Geographic on Primates* at https://www.youtube.com/watch?v=-eLN2ToEIlwM. See also Thomas (1991) for an approach that attends to the entangled-ness of colonial objects. Therein Thomas shows that the circulation of object is not only key to social life but also helps to problematize the distinction between "centre" and "periphery", "here" and "there", or "us" and "them".

intended to entice them to relate to science and technology. An invitation to look at science and technology not merely as instruments of domination that harm the core of who we are (and therefore need to be criticised and fought against). No, science and technology are at the core of the social. Precisely the knot is who we are. Without clean water (technology) we would die, without spectacles a great part of social traffic (e.g. driving a car, reading) becomes impossible, without coffee you would have a headache.

Science is politics with other means, so Bruno Latour (1988, 218)[5]. Yes, and that is why science concerns us all and not only the scientists. We therefore need to go into how knowledge is put into practice, how it can be made relevant and what the consequences are and for whom.[6] Now, attention to science in practice may benefit from an anthropological method, a method that enables us to study everyday routines and concerns. Anthropologists are known for travelling distant places to study *strange* cultures. That is true. But anthropology also teaches us how we can make the familiar *strange*. How to have a fresh view on cultures, which are closer to home. This lead for example to a series of so called laboratory studies. Studies in which the tribes of these STS ethnographers consisted among others, of geneticists, biotechnologists, computer scientists, mathematicians and high-energy physicists[7]. What is interesting about these so-called laboratory ethnographies is that they completely altered the notion that science is something that takes place mainly in the heads of very smart scientists. They pointed at the role of technology and tradition, routine and methods, financial means and networks when producing knowledge[8]. The political intervention made by these studies is not to be underestimated. In contrast to the dominant image of scientific rationality, they offered a view of science as a *cultural* activity. An activity

[5] More in general, Latour (1993) has argued that the modern tendency to separate nature from culture or things from humans has led to a divide between science (representing things) and politics (representing humans). A divide that he has famously termed "the modern constitution".

[6] Scholars such as Donna Haraway, Annemarie Mol or Evelyn Fox Keller have encouraged us to get involved with science and technology. At the same time they have, especially Annemarie Mol, shifted our attention; instead of situating knowledge in theories, laws of nature, method or abstract facts, we need to study science in practice. See, for example Mol (1990).

[7] For the first generation of laboratory studies, see the classics: Bruno Latour and Steve Woolgar (1979), Karin Knorr-Cetina (1981), Mike Lynch (1985), Sharon Traweek (1988) and John Law (1994). These and other STS ethnographers had spent months studying the every day life in various laboratories, and rather than providing us with a critique of the scientific *facts*, they had mapped out *science in action* and drawn our attention to the process of knowledge production.

[8] Latour (1987) has thus suggested a method in which we focus more on the scientist's hands (what she does in practice) rather than his head (what she thinks in general).

which, moreover, is not universal but situated in time and space. *Science as Practice and Culture*, reads the title of a classic volume within science and technology studies (Pickering 1992).

Even though it is fun to be in the laboratory, here I wish to shift our attention to the world outside the lab. Or more specifically, I want to draw our attention to the heavy traffic between laboratory and society and argue why circulations deserve our attention and why an anthropology of science needs to study circulations. Where the first generation laboratory researchers showed us that science is a cultural practice, today I hope to show that *circulations* are cultural practices. Or, to put it more strongly, *circulations make culture*!

One of the fields where this traffic between science and society is very heavy is forensics. Forensics in fact exists by virtue of an intensive relationship between science and society. An example can clarify this traffic. One morning, in the north of the Netherlands, a young woman was found in a meadow. She was murdered, her throat had been slit and her body showed signs of sexual abuse. The forensic team of the police and the coroner secured the traces at the crime scene. Thirteen biological traces, which were found on and around the victim's body, like blood, pubic hair and traces of sperm were sent to the Netherlands Forensic Institute (NFI). Various individuals in the victim's circle were considered as possible suspects, but quickly regarded as uninteresting by the police. An asylum seekers' centre in a nearby village came into view. The consequence was that a number of former residents were suspected by the local people for many years. The fact that the girl's throat was slit with a knife, was described by a politician as a non-Dutch way of killing[9]. People who make a sacrifice by ritually slaughtering a lamb every year, handle their knives and victims in such a way. This was grist to the mill of the local population. Because of the horrific crime the nerves were obviously already on edge, but with this statement about cutting throats, feelings were running higher and became violent, especially towards the residents of the asylum seekers' centre.

After months of investigation the police, however, was left empty-handed. Because, as it happens, also the suspected asylum seekers, whose identities were made public on national television by the crime reporter Peter R. de Vries, could be excluded based on DNA testing. In the forensic laboratory where I was then working, the case did not leave us indifferent. The tensions in society and the conflict that took on racist forms encouraged the head of the laboratory to act. An act, as he called it, of civil disobedience (Knijff de 2006). For, what was the case?

Population genetic research into the mitochondrial DNA (DNA which is maternally inherited) and into DNA on the Y-chromosome (the

[9] Thus was suggested by the late Dutch populist politician Pim Fortuyn (1999). Pim Fortuyn was hinting at he Muslim background of the residents of the Asylum Seekers Centre.

male sex chromosome which is paternally inherited), makes it possible to estimate the geographic origin of a person. Comparing the mitochondrial DNA *or* the Y-chromosome of an individual to a DNA database (holding details of populations from all over the world) you can determine in which population that specific profile occurs more frequent. This way you can make a *probabilistic statement* about the geographic origin of that individual (M'charek 2005a).

But that is population genetics research. The fact that particular research is scientifically possible and sound does not make it legal and admissible in a trial (you cannot simply use it in the criminal investigation). DNA research into the identity or the appearance of an unknown suspect is a taboo in many European countries. In the Netherlands that kind of research was prohibited by law until 2003[10]. When in 2000 the head of the forensic institute decided to conduct research into the geographic origin of the unknown suspect, it was indeed an act of civil disobedience.[11] An act, which was intended to calm people's feelings and to shift the local population's attention from the residents of the asylum seekers' centre to the general population. His research indeed suggested that the Y-chromosome of the unknown suspect is rare in populations from the Middle East (where most asylum seekers came from) and more common in the North-Western European and Dutch population. To be sure the case at issue here is the well known *Marianne Vaatstra* case[12].

Although I made the story of this case comfortably linear, in reality there are endless loops. We saw many things move: evidence, bodily material, documents, people (medical, biological, investigative, legal) expertise, victims, suspects, refugees and legislation. In order to systematise this constant traffic and to analyse the effects, we will single out one element and use that as an example, DNA. By zooming in on DNA and making use of examples of, especially the *Vaatstra* case, I will show the relevance of circulations[13]. I will do this in three steps and argue that:

1) circulations bring about identities;
2) circulations make context; and that,
3) circulations are permanent and can only be stopped actively.

[10] The use of this technology is allowed in the UK, but forbidden in other European countries.

[11] For an overview of the legislation see M'charek (2005b) and Toom (2010).

[12] For a detailed description of this case see Meulenbroek and Poley (2014). Also see M'charek (2005b) and Toom (2010).

[13] Attention for flows and circulations and the politics such movements bring about has been brought to our attention in particular by postcolonial scholars (Anderson 2002). Movements, so Stuart Hall (1992, 293), "provoke theoretical moments". And Stacy Leigh Pigg has put it as follows: "we need to find out more about how science and technology travel, not whether they belong to one culture or another" (in Anderson 2002, 644).

1. Circulations Bring about Identities

Even though nowadays, thanks to popular series like CSI, we are all too familiar with the route from crime scene to the forensic laboratory, it actually is a miracle that the biological traces which were found in the *Vaatstra* case, led to DNA at the Netherlands Forensic Institute (NFI), a place more than 200 kilometre to the south of the crime scene, where subsequently a DNA profile could be developed, which was regarded admissible evidence later in court[14]. It is even more amazing that this was possible without a geneticist or legal expert being at the crime scene. That these are not vain contemplations but serious analytical questions, becomes clear with an anecdote from the controversial O.J. Simpson case. In that case, the famous American football player was suspected of the murder of his ex-wife and her lover. Although all appearances were against Simpson, the DNA evidence failed, among other things, because camera footage showed that the police had secured various biological traces without changing the gloves in between. The biological material was not secured in the proper manner and it may have been mixed with other DNA (contamination). Even if you would be able to scientifically rule out contamination, you need to make it plausible legally[15].

The route from crime scene to court is aimed at making DNA a legally valid piece of evidence. But on that route humans and things arrive changed. Whereas circulations are typically seen as a mere process of transmission of (humans and things) from A to B, I will show here that movement always entails change as well[16]. By moving, "the knot" takes on

[14] See for a classic on the durability of knowledge and objects across geographical distances Law (1986); and for a more recent and beautiful example addressing medical practices, see Pols (2012). For a key paper on the effect of CSI on legal practice see Kruse (2010).

[15] See the special issue focusing on evidence published in response to the O.J. Simpson case in *Social Studies of Science* (Lynch and Jasanoff 1998 and M'charek 2000; 2008).

[16] This is, as we know, a central claim in Actor Network Theory, also known as the 'sociology of translation'. Translation implies *movement* and *change*, see for example, Callon (1986) or Law and Hassard (1999). Working in a more anthropological tradition in her *Gender of the Gift*, Marilyn Strathern (1988) has beautifully shown, that a gender identity does not inhere in bodies. She states: "one cannot read such gender ascriptions off *in advance*, not even when women appear to be the very items gifted. It does not follow that "women" only carry with them a "female" identity. The basis for classification does not inhere in the objects themselves but in how they are transacted and to what end. The action is the gendered activity" (Strathern 1988, xi, italic added). More in general circulation can be considered a classical theme in anthropology. Anthropologists have ever since Malinowski (1922) attended to the movement of people and things (the latter in the form of gifts or goods) and analysed the cultural meaning they trans-

a different composition, a different identity. Starting with the DNA. It is of great importance that the police at the scene, usually Crime Scene Investigators, is not only competent in securing traces but also has insight into the trajectory that follows, the genetic research. When a number of properties of the DNA are not taken into account, DNA may lose its identification power. Let us have a look at some of these properties.

1. *The DNA molecule is robust but cannot bear humidity.* The infamous *Schiedammerparkmoord* case and the subsequent extensive investigation, brought to light that the victim's body was stored incorrectly (in a plastic cover) as a result of which the biological traces of the suspect were unusable, the DNA originating from the suspect was destroyed in the humid environment[17].

2. *DNA is also sensitive to contamination.* This is an extra concern because there often is only a little amount of DNA of the suspect present compared to that of the victim or police officer. This risk of contamination was never before as vividly clear as it was in the case of the Phantom of Heilbronn. Here it concerned a female serial killer who was linked to numerous crimes, in France, Austria and Germany. Between 1993 and 2009 nothing more was known about this killer at large than her DNA. Only in early 2009 the assumption arose that the cotton swabs (with which DNA samples were taken) could be contaminated. It thus soon became clear that the Phantom of Heilbronn was an unsuspecting employee at an Austrian company that supplied the cotton swabs[18]. The cottons swabs are sterilised before they leave the company. Bacteria and fungi die. But it has no effect on DNA. As I already indicated, it is a robust molecule.

3. Finally, *there is a serious risk of swapping samples* and that you are examining the DNA of a different person than that of the person of interest. There are numerous examples of mix-ups. For example, the 25 years old Mohamed Boucharka was picked up time and again between 2008 and 2014 for car-thefts in which he was not involved. At the NFI his DNA profile had been swapped with that of someone else and despite protest and lack of other evidence he was pulled in every time for crimes

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mit as they traffic. The classical reference here is the path breaking edited volume by Arjun Appadurai in *The Social Life of Things* (1986). In my approach I want to move beyond the transmission of *meaning* and focus on the *doing* not just of the things that move, but the doing of the very movement itself, the performativity of circulations.

[17] In this case the ten years old Nienke was killed and her friend Maikel stabbed in a park in the city Schiedam. Cees B was profiled because of paedophilic tendencies and wrongly convicted. After 4 years of detention the actual murderer, Wik H., confessed the crime and a series of blunders that were made during the police and forensic investigation started to surface; see Posthumus (2005).

[18] Claudia Himmelreich (2009-03-27), "Germany's Phantom Serial Killer: A DNA Blunder", *Time* (http://content.time.com/time/world/article/0,8599,1888126,00.html, accessed 8 September 2015).

that were committed by someone else. This mix-up came to the surface when a bright police officer noticed that Boucharka could not have committed a certain crime because he simply was no longer living in the Netherlands[19].

These examples make clear that DNA is more than just biological material. The DNA is inextricably bound up with all those procedures and techniques necessary to be able to use it as means of identification. Without those procedures and techniques, you do not have DNA to start with (maybe a T-shirt with blood on it, but no more than that).

On the route from crime scene to laboratory the forensic team of the police and the forensic researchers in the laboratory need to be attuned to each other's practices. But in order to ensure that the DNA does not only arrive at the Lab but also in court, they also need to have knowledge of legal rules and regulations. These prescribe, for example, that their joint work should result in an uninterrupted chain of custody. In concrete terms this means that every step and every action taken with the evidence needs to be traceable on paper and that this chain may not have any gaps or ambivalences[20]. In short, paying attention to what is needed to make DNA evidence from a biological trace teaches us that the identity of the forensic team is complex. Anticipating the future method in the laboratory and the preconditions, which are set for the evidence in court, changes the identity of the forensic investigator. During her investigative work she is not just a police officer but also a professional who has knowledge of legal and scientific possibilities of the DNA test.

The same goes for the identity of the geneticist. In accord with rules prescribed in the law he has to conduct his research in an accredited laboratory and use validated techniques[21]. This also becomes clear in the *Vaatstra* case. The population geneticist's research into geographic origin, that we encountered in this case, could possibly be regarded as part of unremitting labour that could produce new insights for science. But because he did not examine random DNA but forensic trace evidence, he labelled his work as an act of civil disobedience. This indicates that his *expertise* not only consists of undisputable scientific knowledge, but also

[19] Victor Schildkamp (6 November 2014) "DNA blunder takes six years of my life" ("DNA-blunder kost zes jaar van m'n leven"), AD (http://www.ad.nl-/ad/nl/4561/Wetenschap/article/detail/3784032/2014/11/06/Dna-blunder-kost-zes-jaar-van-m-n-leven.dhtml, accessed 8 September 2015); also see http://www.forensischinstituut.nl/over_het_nfi/nieuws/2014/verwisseling-dna-monster-uit-2008-ontdekt.aspx?cp=119&cs=55898 and https://www.om.nl/vaste-onderdelen/zoeken/@87112/gevolgen-dna/

[20] The quality of partnership and the focus on cooperation between the 'chain partners' received a major boost through the infamous 'Schiedammer Park' murder case. See the report of the committee Posthumus (2005).

[21] For a case in which DNA testing performed by a non-accredited laboratory risked the evidential value of DNA, see M'charek, Hagendijk and de Vries (2013).

of criminal law[22].

The route of the biological material from crime scene to lab and out again comprises therefore more than the transmission of material and information. Along that route a biological trace is made into DNA evidence, a police officer becomes a forensic sleuth and a genetic researcher becomes an expert witness. The various actors together make DNA what it is: forensic evidence. But also the other way around, the DNA that circulates between them makes them what they are; all are more than their occupational title would suggest.

Fig. 1 – Two stills from the video *The Face of Litter*. Source: https://www.youtube.com/watch?v=HwL5HkEAo8k (published 21 April 2015).

But what does DNA make of us? What kind of identities does it give to all those who are not connected professionally to this process, the average citizens? How do circulations between laboratory and society affect who we are and how we relate to each other? Looking at daily news teaches us that genetics already left the laboratories a long time ago and that it mixes in with society everywhere. Whether it concerns issues re-

[22] Because the study was unsupported legally – it was simply forbidden by law – the DNA evidence failed. The DNA research, although it had its effect in society, temporarily leading the focus away from the asylum seekers as suspects, was not allowed to be part of the legal file of Marianne Vaatstra.

garding reproduction, disease and health, criminality and behaviour, origin and history, and yes, even if it concerns your choice of sport or street litter, genetics seems to be relevant (Fig. 1)[23].

In "The Face of Litter' we are introduced to a clean-up campaign in Hong Kong where, by means of DNA phenotyping, a face is given to the 'litter-suspects'; people who supposed to have soiled the public space, an offence that is heavily fined in Hong Kong. The short film shows how the suspects of street litter were given a face and put in the pillory, as it were. Those faces were made based on DNA traces found on cigarette butts, left carton coffee cups and used condoms. If you think that this is a cultural oddity of Hong Kong, or maybe even an art project, you are mistaken[24]. The campaign in Hong Kong makes use of the services of an American forensic company that works together with scientists from Pennsylvania and Leuven and currently also gave this face to the unknown suspect of a murder case in South Carolina, based on DNA (Fig. 2).

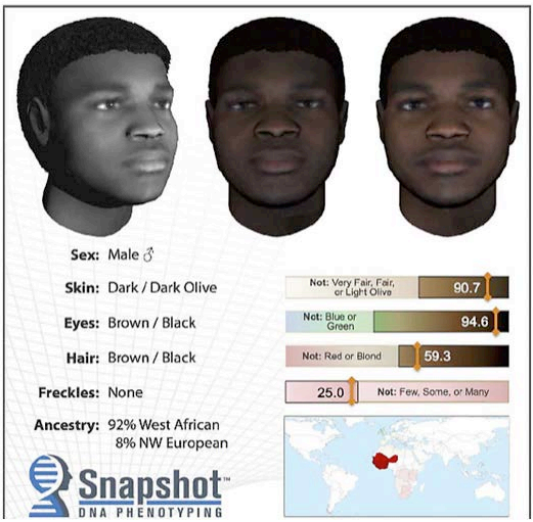

Fig. 2 – Face produced with the help of the analytic software package 'Snapshot' of the American company Parabon NanoLabs, a forensic DNA phenotyping service used to give a face to an unknown suspect . Source: https://snapshot.parabon-nanolabs.com/posters.

[23] See M'charek (2013) for some varied examples, but there is a vast scholarship on the social and legal aspects of genetics. For a Dutch example wherein DNA testing is made relevant for the general public in the context of sports and physical health, see: https://www.dnafit.com.

[24] See e.g. the well-known art project of Heather Dewey-Hagborg who uses similar forensic genetic technologies to produce a face based on litter collected in the streets (http://deweyhagborg.com).

There is a lot that can be said about this, but not here, today[25].

Since its introduction into the courtroom in the late eighties, DNA is the unchallenged champion of forensic investigation[26]. It is the golden standard and the key to identifying suspects and victims. It actually started with an issue regarding family reunification in Great Britain in 1984. A Guyanese mother wanted to bring her son to England, but could not prove their kinship relation with documents. When Alec Jeffreys (now Sir Alec Jeffreys!) became aware of the matter he suggested to test the relation via DNA (Jeffreys et al. 1985). This way he could prove that the young man was indeed this woman's son and the brother of her children. Soon the question presented itself whether this technology with which similarity or difference could be established between two individuals could also be used in a comparison between a biologic trace left at a crime scene and an individual.

Enters Forensic DNA! And the rest is history…

2. Circulations Make Context

Circulations are not merely transmissions. At issue is not simply the movement of people and things from A to B. No, as I just argued, movement also means change. Circulations therefore produce new identities. Circulations are performative. And they do more! Within the social sciences the context is represented as a stable factor, it is the firm ground beneath any social science research, or so it seems[27]. Proper research takes the context into account as to explain phenomena. Globalisation for instance (an exemplar context: large, cumbersome, everywhere, so it seems) is often regarded as the cause of enormous circulations on a global level[28]. But it actually is the other way around. For example, the fact that in our society the demand for and the interest in genetic knowledge are increasing is not the cause of circulation, but the result. Precisely circulations perform a context where society and genetics can relate to one another. In short, circulations are not the result of the context. No, circulations produce context[29].

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[25] See for a first attempt, M'charek, *Data-Face and Ontologies of Race*, Theorizing the Contemporary, "Cultural Anthropology website", March 24, 2016 (http://www.culanth.org/fieldsights/835-data-face-and-ontologies-of-race).

[26] National Research Council (1996); Lynch, Cole, McNally and Jordan (2008) and Williams and Johnson (2008).

[27] For a problematization of this take on 'context', see Asdal and Moser (2012).

[28] See for examples Lee and Lipuma (2002). In fact circulation is often evoked together with globalisation.

[29] For another example of rethinking self-evident, often hierarchical, often causal, relationships, through the figure of the parasite, see Michel Serres (2007

Just imagine, a murder is committed, here and now in this church (Fig. 3). Within no time, this sacred ground, cemetery, place of science and dialogue will change into a forensic laboratory. Something like in fig. 4.

Fig. 3 – The Old Lutheran church at the Spui in Amsterdam filled with listeners. Source: http://www.uva.nl/nieuws-agenda/nieuws/uva-nieuws/content/nieuwsberichten/2012/07/uva-opent-academisch-jaar-met-blik-op-europa.html.

It is obvious that the forensic lab is far away: in The Hague or Leiden. Yet under such circumstances, a change of context would take place right in front of our eyes. People in white suits, hands and feet protected, enter the space. Science and technology move in. A system of investigation, of detecting traces, analysing, securing, and documentation will unfold. And as we have learned there is more that enters the room. Law and regulations will settle themselves on the shoulders of the forensic investigator. Possibly the media will enter the new space. This all shows that the boundary between the laboratory there and society here can easily be undone. In this case that would be temporarily. But the point I want to make is that such shifting of boundaries between practices is an everyday phenomenon, a matter of fact. The second point is that this should not be

[1980]): 224-234). There is a family of resemblance here with Appadurai's (1996) theory of flows. This theory (and its counterpart, "the production of location") is about how – when modernity goes global – the circulation of people, ideas, media, technology, and finance provides the generative matrix for creating numerous and disjunctive "imaginary worlds". My point here is that the fact of circulation and its performative capacity is not limited to a mode of production or a global organization of the social. It is rather a matter of life.

regarded as a typical example of the "colonisation of society by the powerful science". Because there are also reverse movements.

Fig. 4 – The Old Lutheran church at the Spui in Amsterdam filled with listeners and a forensic team. Source: olafposselt.com.

To clarify that let us return to the *Vaatstra* case. On 7 October 1999, there was an information evening in the Frisian city of Kollum about the expansion of the asylum seekers' centre. This meeting, however, got completely out of hand. In his inaugural lecture the population geneticist and head of the Forensic Laboratory for DNA Research (FLDO) Peter de Knijff relates the following:

> Shortly after, I receive a call from someone on the team of police investigators responsible for the investigation into this murder […]. The request was simple: could the FLDO help? Was it possible in any way to get a clue [about] the geographic origin of the offender by means of a DNA test? The team had heard that we were working on such a method. If […] it could be proven that the offender was not an immigrant but, for example a Frisian, there was a fair chance that it would become quiet again (de Knijff, 2006: 2).

The resentment and insinuation against asylum seekers thus entered the lab and helped to move the DNA research into a different direction. This way societal concerns helped to make the laboratory into a socially engaged entity. While law and regulations reside on the shoulders of the forensic geneticist, he decides to an act of civil disobedience, and carry out DNA research that was prohibited by law.

3. Circulations Are Permanent and Can only Be Stopped Actively

A third and last characteristic of circulations, which I would like to attend to here is that circulations are not the exception but the rule. Simply put: everything moves, from the level of the molecules to the social order. And it moves permanently. But circulations can be channelled or even stopped[30].

During the *Vaatstra* case four DNA laws were implemented in the Dutch criminal law, of which two were directly 'provoked' by the case itself. In 2001 an extension of the first DNA law was introduced. This makes it possible to apply DNA testing in cases of High Volume Crime, like burglaries and care thefts. The 2001 law also regulates the compiling and using of DNA databanks. In 2004, in view of that databank, the *DNA Testing convicted persons Act* became operational. It states that all those who were convicted of an offence with a penalty of 4 years or more (and that is easily done, because it concerns the maximum sentence) are summoned to give DNA to be stored in the databank. Currently the DNA databank holds *245,826* profiles[31]. In 2003 the Externally Visible Personal Characteristics Act came into force. And in 2012 the Law on Familial Searching became a fact; the law with which the suspect in the *Vaatstra* case got caught. This law makes it possible to start looking for partial matches. For example, by comparing DNA left at the crime scene with profiles in the DNA database, or with those of participants in a population screening. A partial match points to the possibility that the sus-

[30] This resonates with Marilyn Strathern's (1996) instance on the importance of cuts and the cutting of networks, stopping the flow and extension. In her *Partial Connections* (1991), Strathern's argument is more methodological and aimed at problematising the ideal of social science research to present the "full picture", or "wholenes". She puts it as follows: "The realization that wholeness is rhetoric itself is relentlessly exemplified in collage, or collections that do not collect but display the intractability of the disparate elements. Yet such techniques of showing that things do not add up paradoxically often include not less cutting but more – a kind of hyper- cutting of perceived events, moments, impressions. And if elements are presented as so many cut-outs, they are inevitably presented as parts coming from other whole cloths, larger pieces, somewhere" (Strathern 1991: 110). Moreover, the notion of circulation advanced throughout my talk steers clear from a so called 'equilibrium thinking' (common in e.g. economic theory), i.e. the idea that all movements will come to an end by themselves (think e.g. of the alleged work of the invisible hand of the market), once equilibrium has been reached. As if equilibrium is the nature of things. Attending to circulation is precisely aimed at understanding how, when and where things are moving or rather stopped (see also Lee and LiPuma 2002).

[31] See: https://dnadatabank.forensischinstituut.nl/010RDNAdatabanken/010-DNAdatabankvoorstrafzaken/010Samenstellingenwerkwijze/index.aspx.

pect is a family member of the person with whom the partial match was found (a brother, father, uncle, etc.).

These laws are the effect of the heavy traffic between science and society. And even though, especially in the case of forensic DNA evidence, they assign detailed roles and set boundaries between science and society, they also encourage and maintain the traffic between them. The well-filled DNA database is just one example. One could say that with this chain of legislation the DNA has created its own infrastructure, an infrastructure that maintains continuous circulations between science and society[32].

The fact that circulations are permanent does not mean that circulations cannot be stopped. There are numerous examples of temporary or more durable stops. A prosaic example. In the forensic laboratory extracting DNA (taking DNA out of the cell) is a critical moment. In particular when it concerns fragile, dirtied or little evidence, the laboratory is afraid of possible contaminations. A small piece of foreign DNA at the start of the process may become dominant due to the techniques that are used and 'overshadow' the evidence (think of the Phantom of Heilbronn). But the fact is that everywhere where there are people, there is bodily material twirling around in the room. In order to prevent these twirling biological parts contaminating the evidence, the air in the laboratory is regulated. There are rooms with overpressure and with under pressure in relation to each other. Where the DNA is extracted there is overpressure. Twirling particles are kept outside, or at least pushed out of this lab space. Circulations stopped. Stopping circulation at this basic material level presumes work. It makes use of knowledge and technology to regulate air circulations. It is work that is aimed at isolating the DNA, as well as being serviceable to arriving at the legal truth and to the course of justice. This thus shows that stopping circulations is not only a technical but also a normative matter.

A second example from the *Vaatstra* case. When it was finally legally possible to make use of Familial searching, to everyone's surprise the ending of the *Vaatstra* case was much faster a reality than expected. 7,581 men were invited to donate DNA and already in the first batch of 81 men, two Y-chromosomal DNA matches were found. Charissa van Kooten, who coordinated the DNA testing at the NFI, established these par-

[32] This is one could say and example of what Lee and LiPuma (2002) have called "cultures of circulation". What I try to allude to here reminds us also of the rugby example that Steven Brown mobilises to explicate the universe of Michel Serres: "Consider a game of rugby. The players are oriented around the ball, the token. They act in relation to the token, which is like a little sun around which the players orbit. The players become almost extensions of the token – its attributes. They are the means by which it passes, their movements have the sole aim of maintaining the play, of passing the token between one another. In so doing the token weaves the collective" (Brown, 2002: 21).

ticular facts. After a reality check with colleagues she called the team of police investigators. Their premise was that they did not have the suspect but a family member and that they still had to investigate into the suspect.

> I phoned through the matches to Ron Rintjema of the 3D-team (team of police investigators, AM). The 3D-team obviously *did* have the names that went with the DNA- seal codes […]. The 3D-team subsequently had the genealogy of the two families drawn up at the Netherlands Centre for Family History CBG) in The Hague. […]. It concerned two families with one common remote ancestor, a certain Jasper Jans, of whom was known that he was an innkeeper in *Westergeest* in 1748. The large diagram with all the family lines came to hang in a prominent place in the room of the 3D-team (Lex Meulenbroek and Paul Poley, 2014, pp. 445-446).

It is clear that genealogical knowledge and family trees had entered the police station and that there is traffic between the station and the forensic lab in the form of e.g. information, telephony, DNA seal codes. But the example is particularly important because it shows that certain circulations were brought to a halt. The names that go with the DNA do not end up in the laboratory (i.e. in case of DNA familial searching). This stop has been provided for by law and is necessary to protect civilians who are in no way related to the crime. It is therefore also a political stop of circulations.

Circulations bring about identities, they bring about context and they are permanent unless we actively stop them. And that, I would like to emphasize, does not only apply to the forensic practice, but also to all other domains, for example medicine, food supply, ecology, human migration, financial markets, etc. That is why circulations are crucial objects of study and why an anthropology of science should attend to them.

4. Circulation and Anthropology of Science: Political Consequences

My argument in in this address was about the ways in which various actors that are involved in forensic research relate to one another in varieties of configurations. They literally bear responsibility for the DNA together. Given this inherent involvement, the responsibility of geneticists for these identification techniques does not stop at the laboratories' walls. We hear scientists claim only too frequently that they merely produce knowledge and that society makes normative considerations[33]. Circulations show that scientists and legal experts, police and justice, citizens and politicians are inextricable part of this process. They/we together bear re-

[33] In a series of publications we have tried to communicate this problematics to forensic geneticists (see. M'charek, Toom and Prainsack 2011; Toom et al. 2015).

sponsibility for what technology makes of us.

To illustrate, again the *Vaatstra* case and we go back in time. Because tactical and technical research did not provide further clues about the identity of the suspect after six months, in December 1999, a DNA population screening was carried out. 186 men were invited to give their DNA. These men were selected because they were, for instance, acquaintances of the victim, or because they had already been convicted for sex offences[34]. Participation in the screening is officially voluntary. But you incur suspicion when you refuse to cooperate. Renze Merkus (I mention his name because he contacted the media himself to share his story) was such a person[35]. Because he kept refusing, the Examining Magistrate invoked the *Toothbrush decision* to get his DNA. This decision states that, for the purpose of the criminal investigation, use may be made of bodily material that is not directly, knowingly and willingly, taken from the suspect[36]. At issue is bodily material that we all unconsciously leave around. Based on DNA testing on cigarette butts and paper-tissues collected in the environment of Renze Merkus, he could be excluded as a possible suspect. This application gnaws at an important constitutional principle: the *presumption of innocence*. This principle says that as a suspect you are innocent until proven guilty (also see M'charek 2008; Toom 2010; Toom and M'charek 2011. This constitutional foundation is now shifting. Because of the DNA that circulates between us, as a citizen, one becomes guilty until DNA excludes one as a suspect.

Furthermore, the research into the geographic origin of the unknown suspect led to the conclusion that the profile of the suspect is more common in the Netherlands and in North-western Europe. It is significant that this was immediately translated in the media to: the offender is a *white* man. This racialisation of identities is even made explicit in the law which was elicited by the *Vaatstra* case. In the Externally Visible Personal Characteristics Act, which became effective in July 2003, it is stated that DNA testing should be aimed at establishing 'the "race" of the unknown suspect'[37].

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[34] "These are men with whom the murdered Marianne Vaatstra had contact, men who were convicted for sexual offenses in our country in the past and men whose names were mentioned by others as a possible subject or because they were seen around the time and place of the crime", *NRC Handelsblad*, 20 December 1999.

[35] See e.g. http://www.trouw.nl/tr/nl/5009/Archief/article/detail/2507398-/2000/04/27/Geheime-DNA-test-in-zaak-Vaatstra.dhtml.

[36] "When obtaining a sample of cellular material is not possible for serious reasons (for example when a suspect is fiercely resisting) *non-collected body material* can be used, such as a hair or saliva on a coffee cup". https://-www.om.nl/vaste-onderdelen/zoeken/@59953/nieuwe-dna-wetgeving/.

[37] Article 151d: paragraph1. The prosecutor may order a DNA test aimed at determining externally visible characteristics of the unknown suspect; Article 151d: paragraph2. The DNA test can only be aimed at establishing the sex, the race or other externally visible characteristics designated by order in council, see

Article 151d: paragraph2.

The DNA test can only be aimed at establishing the sex, the *race* or other externally visible characteristics designated by order in council (italic added).

And that brings me to my last and maybe most explosive point: *race*. Although current population genetics does not rely on a concept of race, this much is clear from the impressive research results, biological race has been introduced in the Dutch Criminal Code. This way *geographic origin* was made into *race*. This in itself is a curious given in a country that does not know race and considers itself post-racial. But it points to a much more extensive problem which goes hand in hand with the role of current life sciences.

When in June 2000 the completion of the draft of the human genetic map was announced, this map was presented as a monument of human communality and a proof of the equality between people. We are more than 99.9% the same, said Bill Clinton (during this high profile presentation). Ironically from that moment onwards not the communalities but the differences, the 0.1%, became the object of research. Whether in the field of medical genetics or behavioural studies, historical archaeology or forensics: difference has become the prime focus and where the research money goes into.

With this attention to differences, and given the biologization and geneticization of numerous social phenomena like behaviour, disease, origin etc. we have invited in a classic problem back in, race[38]. As the common story goes, after WOII, after a long history of racist science, we declared race dead[39]. Race, as was stated in the famed *UNESCO statement on Race*, had no scientific basis[40]. But *pronouncing race dead also turned into silencing race.* Especially in a country like the Netherlands, the idea prevails that we don't do race. It is irrelevant. Nowadays, with the enormous impact of the life sciences, we seem to be overtaken on all sides by history and as social scientists we risk to be left empty-handed. How can we make the knot which we call race researchable? And what is race? When are differences made into race and when not?[41]

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also the website of the Dutch Senate: https://www.eerstekamer.nl/wetsvoorstel/-28072_dna_onderzoek_in_strafzaken.

[38] There is a growing corpus of literature addressing the various ways in which race has become a growing matter of concern in e.g. health care research, medical practice, pharmaceutical research, genealogical science (Duster 2003; Abu El-Haj 2004; Fullwiley 2007; Montoya 2007; Kahn 2008; Whitmarsh and Johnes 2010; Schramm, Skinner and Rottenburg 2012).

[39] As has been observed race did not fade away after WOII, neither in research nor in society (Lipphardt 2012). Yet this ideological turn was and is crucial.

[40] See on the different Unesco Statements on Race and their politics Selcer (2012).

[41] See for some attempts at this M'charek (2013); M'charek (2014); and M'charek, Schramm and Skinner (2014), which is a special issue in which I to-

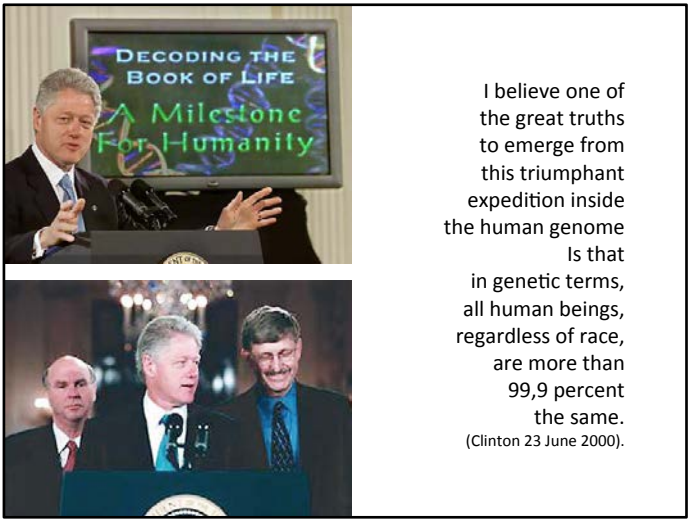

Fig. 5 – American president Bill Clinton (top and middle below) together with Genome researchers Craig Venter (below left) and Francis Collins (right) during the presentation of the rough chart of the human genome project in June 2000. Sources: http://pic.biodiscover.com/files/y/25/biodiscover1369274469.-5757490.jpg and http://www.the-scientist.com/?articles.view/articleNo/12937/-title/The-Human-Genome/.

The political question here is: how can we take biology and genetics seriously and at the same time prevent ourselves as societies from racism? In order to find answers to these questions I developed the RaceFaceID project[42].

gether with a number of colleagues have started to carve out possible specificities to race in Europa.

[42] "Race Matter: On the Absent Presence of Race in Forensic Identification" (RaceFaceID), a five-year research project funded by an ERC Consolidator Grant. The team consists of the following PhD students, post doc and associate researchers: Reanne Bleumink, Lisette Jong, Marianne Fotiadou, Lieke Wissink, Ildikó Plajas, Roos Hopman, Alana Helberg-Proctor, Irene van Oorschot, Jeltje Stobbe, Denitsa Gancheva. My thinking on, or rather the questions that I have started to ponder *vis a vis* race are highly inspired what could be termed a version of post-colonial STS, wherein I try to think ANT's affinity for materiality and relationality with postcolonial concerns with temporality, ambivalences and processes of othering. On Postcolonial STS, see Anderson (2002); Mcneil (2005); Verran (2002); Prasad (2008); De la Cadena (2010); Lin and Law (2014).

Fig. 6 – The three forensic practices that are examined in the RaceFaceID project: (1) *genetic facial phenotyping* (2) *craniofacial reconstruction* and (3) *facial composite*.

In this project we research a number of forensic techniques with which a face is given to an unknown suspect or victim. The project attends to ways in which face-making is also involved in race-making. Therewith it allows us to address an obvious yet overlooked question: what is race? Not to answer this conclusively or to provide a universal answer to this question. But rather to unravel what race is made to be in practice (see M'charek 2013 for an example of this 'race as a practice' approach). To do so, we follow the face-making techniques around, from Research and Development, via the forensic laboratories, the police stations, the media, to the courtroom. Rather than defining race we work with the heuristics that we cannot know the individual without situating the individual in a population (a group). We thus focus on the relation between individual and population on the route from crime scene to court and attend to moments when population is translated into race; how that happens and with what purpose. The idea is that race is more than a simple biological definition or an ideological interpretation of differences. In this research we aim at developing a vocabulary and methods with which we can study race in science and society, to gain more insight into how race is given shape in specific practices and to develop and understanding between race and racisms.

This new research was the source of inspiration for my story here. I took the heavy traffic between laboratory and society seriously and substantiated why circulations deserve our attention and why an anthropology of science needs to study circulations. I made three interventions in current academic debates on identity, context and continuity. In my argument I build on, or move away from, work developed in Anthropology, Science and Technology Studies, Feminist Science Studies and Postcolonial Studies of Science. My contribution lies in the fact that I have tried to focus these insights on the concept of circulations. By way of rounding up and connecting with the special issue on 'digital circulation' (Balbi, Delfanti and Magaudda 2016), I will now articulate the theoretical lessons learned on circulations.

Movements, so Stuart Hall (1992, 293), "provoke theoretical moments". As I was writing this address, in August 2015, I stumbled over the important paper of Benjamin Lee and Edward LiPuma (2002) and to my surprise their argument appeared akin to mine. In their article they set out to move the concept of circulation beyond its traditional understanding. Circulation is no longer to be understood as a transmission, a simple movement of people, commodities, or ideas from one place to another, or as a unidirectional relation between production and consumption. Rather they invite us to attend to circulation as a *performative* event that co-shapes humans and things as they move through space and time and it does so in situated manners. "[C]irculation is a cultural process, with its own forms of abstraction, evaluation, and constraint, which are created by the interactions between specific types of circulating forms and the interpretive communities built around them (Lee and LiPuma 2002, 192). Lee and LiPuma suggest to view these structured circulations as *cultures of circulation*.

It is not difficult to understand the practice I described above, the practice of forensic DNA, as an example of structured circulation. Yet, although the infrastructure of forensic DNA is fairly structured, I have in fact tried to attend to emergence and surprising movements. And it is precisely here where I depart from Lee and LiPuma. Whereas they privilege structured circulations, I suggest widening our scope and attending to the permanency of circulations. Humans and things are permanently on the move producing more or less durable infrastructures and changing themselves and their environments as they move about. However as I have shown, circulations are also actively stopped. There are physical borders, laws, language barriers, networks that are down, etc. It is the relation between flow and stops that can become more or less durable, more or less structured. It also means that circulations become structured precisely as to overcome contingencies and possible stops. Rather than reducing our scope to a particular mode of capitalism (circulation-based capitalism, as Lee and LiPuma do) or a particular infrastructure for flow (globalisation), I suggest a more open view on circulations and what circulations do. It seems to me that a focus on the relation between flow and

stops might help us to understand better the politics of circulations.

In the literature on circulation there is a tendency to think this concept together with globalisation, to think flows in Euclidian spaces and movements spanning large distances in short periods of time (see e.g. Appadurai 1990; Lee and LiPuma 2002). The relations suggested here are largely modernist: both space and time are envisioned as linear, suggesting self-evident relations. For example in this approach it is tempting to think the relation between the local and the global as: small versus large, weak versus powerful and transient versus durable. However, Actor Network Theory teaches us that identities are effects of network relations and that these relations do not occupy a Euclidian space but relate topologically (see e.g. Mol and Law 1994; Law 2004). Size or power do not inhere in entities but are performed in relations and they are performed somewhere in space in time.

It is precisely in this vein that I have suggested that circulations enact identities as well as contexts. For, often and again globalisation is seen as the primary mover, the context or the scene against which significant events take place. But if circulations of DNA help to enact context, could we also envision ways in which circulations enact the global, rather than the other way around? To be sure, rather than closing off or providing the final answer about e.g. globalisation, this observation invites more questions about circulations. It invites us to attend to the doings of circulations. How do circulations materially produce what we come to know as the global or the local, the near or far, the now or then, and the we or them? For the issue is not how do cultures bring about circulations, but how do circulations produce cultures.

Acknowledgement

I am very grateful for the invitation to publish this version of my lecture in this timely double special issue on Digital Circulation. I thank Paolo Magaudda for his patience and guidance.

I would like to thank the European Research Council for supporting my research through an ERC Consolidator Grant (FP7-617451-RaceFaceID-Race Matter: On the Absent Presence of Race in Forensic Identification).

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Disciplining Change, Displacing Frictions

Two Structural Dimensions of Digital Circulation Across Land Registry Database Integration

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Abstract: Data acquire meaning through circulation. Yet most approaches to high-quality data aim to flatten this stratification of meanings. In government, data quality is achieved through integrated systems of authentic registers that reduce multiple trajectories to a single, official one. These systems can be conceived of as technologies to settle "data frictions", controversies about which configurations of actors, agencies, sources and events produce more reliable data. Data frictions uncover two dimensions of data circulation: not only along the syntagmatic axis of alignment, but also along the paradigmatic axis of replacement. Drawing on empirical research investigating database integration at the Dutch land registry (Kadaster), this article aims to contribute to the theorization of digital circulation by recalling two semiotic dimensions along which circulation happens. It argues that even when complex infrastructures are implemented to discipline change, data frictions are not silenced, but displaced along the syntagmatic/paradigmatic axes.

Keywords: Data frictions; database integration; land registry; data circulation; syntagm; paradigm.

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1. Introduction

Contemporary accounts using the metaphor of digital circulation highlight the "obduracy" of data. "Big Data" applications, for example, conceive of data as stabilized resources that can be combined along integrated, streamlined networks. While it is widely accepted that the way data are matched can have profound sociotechnical consequences (Mayer-

Schönberger and Cukier 2013), the relationship between data and the states of the world from which they are drawn (the "facts") is less often problematized. As Gitelman and Jackson (2013, 2-3) recall, "data are apparently before the fact: they are the starting point for what we know, who we are, and how we communicate. This shared sense of starting with data often leads to an unnoticed assumption that data are transparent, that information is self-evident, the fundamental stuff of truth itself".

Media scholars seem to have less problems in recognizing the crafted nature of data. According to Rosenberg (2013), for example, while the term "fact" retains an ontological status, and "evidence" an epistemological one, the semantic function of the term "data" is eminently rhetorical. It indicates the pre-given elements in an argumentation, which do not undergo debate. This rhetorical function of data is not a contemporary trend, though. "Data" have been historically constructed as objective items by design. The first appearance of the term "data" in English, for example, goes back to the seventeenth century, when in mathematics, philosophy and theology it was used "to identify that category of facts and principles that were, by agreement, beyond argument" (Rosenberg 2013, 20). Similarly, in her seminal work on the history of the modern understanding of fact, Poovey (1998) wonders whether facts are incontrovertible data that demonstrate the truth, or theory-laden pieces of evidence aimed at persuasion. Only in the first case, she concludes, facts have been called "data".

If data correspond by definition to logical assumptions, then the matter of concern for an emerging theory of data circulation is not so much pointing out their inherent bias, as much of the early discursive literature on digitization did (see among others Introna and Nissenbaum 2000). Rather, the question a sound theorization of the digital circulation of data should pass to address concerns the *material processes* through which data can reach the status of (and are kept as) such incontrovertible assumptions. How are data constructed in specific ways throughout the standards, protocols, paths wherein they circulate?

As of today, the constructed nature of data is shared understanding to a growing scholarship at the intersection of Science and Technology Studies (STS) and media studies (see among others Beer 2013; Beer and Burrows 2013; boyd and Crawford 2012; Kitchin 2016; Leonelli 2013; Vis 2013). As the editors of these two special issues rightly point out by drawing analogies with the early work of Appadurai, data acquire value and meaning through circulation (Balbi, Delfanti, and Magaudda 2016). This implies that a theory of data circulation cannot avoid considering the infrastructural technicalities that contribute with potentialities, constraints and path-dependencies to the "biographies and life trajectories" of data (Balbi, Delfanti, and Magaudda 2016, 8). The meaning of a set of data will thus emerge from the sedimentation of multiple passages, bringing trace of the standards, protocols, categorizations through which it reached the current form.

Yet most approaches to data try to conceal this stratification of meanings and values. Achieving high "data quality" has become a sensitive goal in order to implement applications. In many organizations, programs aimed at enhancing data quality provide the normative and technical infrastructure to pursue the flattening of data biographies and life trajectories. Normatively, high quality data are assumed as neutral and a-historical representations of states of the world, a Platonic substance to which actual data used in everyday practices should tend. Technically, sophisticated systems integrating databases at diverse levels are being developed in order to reduce multiple dataset versions to a single, most reliable one.

Achieving high-quality data is, if possible, even more strategic for governments, which conceive of data as the incontrovertible foundation on which policy is erected. As Agar (2003) has recalled, government bureaucracies were even built around the goal of ordering data circulation paths and optimizing data assets. This usually translates in integrating databases in hierarchical order. In contemporary processes of back-office integration, for example, quality of data can be enhanced through so called "systems of authentic registers" (de Vries 2012). Similar systems are meant to provide administrative agencies – in the fulfilment of their institutional duties – only with information from databases that have been labelled as the official ("authentic") source for that type of information.

Similar integrated architectures aim to reduce multiple, heterogeneous data trajectories to a single one, by legislatively and technically defining which administrative database is leading, and which ones are the recipients. While their goal is to reduce misalignments between data generated in different ways and at different times, double entries and mismatches uncover the irreducible nature of data, even in law-regulated governmental information infrastructures. One can thus wonder how similar systems are implemented, so that data can be certified as "authentic". Which alternative forms of knowledge, actors and versions of the past are silenced in the pursuit of high-quality data? What are the "costs" of assuring the objective standardization of data?

To use the words of Edwards (2010), systems of authentic registers aim to settle "data frictions". While "data" is the name given to the outcome of procedures aimed at crystallizing change, attempts to codify change into univocal digital trajectories inevitably entail frictions between competing procedures. In the next sections we thus propose to conceive of data frictions as controversies about which configuration of actors, events and knowledge sources produce more reliable data. This understanding will be exemplified against the frictions arising when older procedures for government data production are replaced with newer, "more reliable" ones for high-quality data production.

The notion of "data friction" will also help us to uncover two dimensions of data circulation. While most studies on digital circulation tend to conceive of circulation as alignment of data, files, digital artefacts from a

point to another, they forget to consider the complementary movement of replacement. However, data and other digital artefacts do not only circulate *along* infrastructures, they also circulate *across* infrastructures. This point is expressed by the structuralist distinction between syntagmatic and paradigmatic dimensions of change, that will be introduced in section 2, as well.

This article's goal is to contribute to the theorization of digital circulation by recalling the two complementary dimensions along which circulation happens: not only along the syntagmatic axis of alignment, but also along the paradigmatic axis of replacement. It argues that, in order to circulate on one of the two dimensions, data have to "pay the price" on the other dimension. Less abstractly, the article shows that even when complex matching infrastructures are implemented to discipline change, digital circulation does not completely silence frictions, but displaces them along the chain of data circulation. Further new actions on the syntagmatic axis must thus be undertaken to handle frictions on the paradigmatic one.

In sections 3 and 4 this argument is exemplified against an empirical research investigating database integration at the Dutch land registry. The research was conducted between 2013 and 2015, and shows that silencing frictions between old and new procedures for enhancing personal data quality required to activate further new procedures and organizational units to handle uncertain cases. Section 5 will summarize the findings and discuss them in the light of the syntagmatic and paradigmatic distinction. Finally, the conclusions will focus on how the empirical findings presented and the concepts used can contribute to the theorization of digital circulation.

2. Data Frictions, the Two Dimensions of Change and the Context of Analysis

"Data" is the name given to the outcome of efforts to discipline fleeting states of the world towards other ends. "Data need to be imagined as data to exist and function as such […]. [*D*]*ata* are imagined and enunciated against the seamlessness of phenomena. We call them up out of an otherwise undifferentiated blur" (Gitelman and Jackson 2013, 3, authors' emphasis). This phenomenological stance describes the production of data from an undifferentiated experiential continuum. However, it does not say much about the life trajectories of data processing, distribution, re-use and combination. To what extent can also further steps of data circulation be described in a constructivist way?

Data circulation models usually rely upon the information flow metaphor (Castells 1996), which in turn can be traced back to the origins of telecommunication theory. According to Shannon and Weaver (1949), six

elements constitute any formal model of communication: an information source, a message, a transmitter, a channel, a receiver, a destination. The message is supposed to flow along the channel in a stabilized form and in a linear way. Thus one of the main assumptions of data circulation is that data are discrete full-blown and relatively stabilized units of information circulating throughout digital infrastructures serving as backbone.

This decoupling of content and channel underpinned by the flowing metaphor characterizes most approaches in the Information Society. Van Dijk (2012), for example, sees a lightly deterministic relationship between the networked model of data circulation and the emerging combination of organizational forms leading to network economy. Similarly, Mayer-Schönberger and Lazer (2007) point out the interaction between information flows and power redistribution in government organizational structures, but they do not consider how data themselves undergo transformations along this distribution. In similar conceptualizations of information as "flowing inside" infrastructures, data are conceived of as stabilized entities that can be successfully transported from point A to a point B once the right infrastructural elements are aligned.

However, while "flow" suggests the smooth movement of a liquid, "data do not flow like oil" (Borgman 2015). Nor do they circulate immutable from the database to the application server through multiple web services. Rather, data must be adapted, re-coded, standardized, harmonized. Far from being smooth-running activities, similar practices entail controversies about which configuration of actors, events and sources are generative of more reliable data. When, for example, a bank is required to share data with the tax office, tensions might arise about the format in which data should be codified: language, categorizations, update frequency, granularity of values, to name a few elements. In a similar case, decisions on which format should be adopted imply a pre-emptive decision on which organization and set of procedures can assure the highest quality of data.

In other words, data circulation requires constant attempts to discipline multiplicity and change. A similar disciplining effort inevitably entails tensions. Edwards (2010) has distinguished three types of tensions. "Computational friction" refers to time, human and energy resources needed in the processing of numbers: "[t]he terms 'input' and 'output' express the moments at which numbers pass from inside the computer to outside it, but many things happen to those numbers before they become input and after they become output. Every calculation requires time, energy, and human attention. These expenditures of energy and limited resources in the processing of numbers can be called *computational friction*" (Edwards 2010, 83, author's emphasis).

Whereas computational friction opposes the transformation of data into knowledge and information, and thus reduces the amount of information that can be extracted from an input, "metadata friction" concerns obstacles in computation and data processing to make them commen-

surable and comparable. "The effort involved in finding existing metadata, digitizing them, and combining them with whatever metadata you already have might be termed 'metadata friction'" (Edwards 2010, 318). Edwards and colleagues (2011) further extend the notion of metadata friction to describe conflicts arising among scientists using metadata to enhance interoperability among scientific data, tools and services.

For the purposes of this article, we are particularly interested in the third type of friction, what Edwards called "data friction". Data friction "refers to the costs in time, energy, and attention required simply to collect, check, store, move, receive, and access data" (Edwards 2010, 84). Data friction is deeply influential for digital circulation, in that it constitutes a constraint to circulation: "[w]henever data travel — whether from one place on Earth to another, from one machine (or computer) to another, or from one medium (e.g. punch cards) to another (e.g. magnetic tape) — data friction impedes their movement" (Edwards 2010, 84).

Noteworthy for us here is the widely encompassing idea of data circulation suggested by Edwards. Data move along two dimensions: not only between different actors and organizations, but also between different media and materialities. Obtaining "data from many locations, consistent across both space and time [requires] a lengthy chain of operations, including observation, recording, collection, transmission, quality control, reconciliation, storage, cataloguing, and access" (Edwards 2010, 84). Any of these translations – be it from one actor to another, or between two different materialities – constitutes an opportunity for data loss or corruption, that is, it offers an interface for data friction.

To illustrate the fragility of this concatenation of processes, Edwards discusses the case of climatological data in the first half of the twentieth century, when meteorological computation witnessed the competition between incumbent analogue and incipient numerical approaches. Data friction was caused, for example, by the need to communicate measurements over telegraph, or between two operators, or to encode them in Morse code. Eventually, data friction widened the practice gap between data used by empirical forecasters and those needed by theoretical climatologists.

The concept of data friction is useful for a theory of data circulation in that it helps to recover two dimensions of circulation: not only between two spatial or organizational points, but also between different materialities. Whereas the materiality of data is a recognised starting point for much literature on data circulation (Dourish and Mazmanian 2013), the debate usually lingers on a vague analytical or even ontological distinction between the socio-cultural and the material (Bates, Lin and Goodale 2016). Differently, we propose that in order to grasp the transformations that data undergo when circulating, we need to appreciate the combination of the two relational, rather than ontological, movements of *alignment* and *replacement*. Section 2.1 introduces this structuralist distinction, and stresses the importance for a theory of data circulation to grasp

not only the alignment of existing infrastructural elements, but also the potentialities that might arise from their replacement.

A second gap in the debate concerns the fact that data frictions are not seen as rich analytical sites (Pelizza 2016a), useful to uncover data biographies, but as undesirable interferences to be silenced. Therefore, the question of how infrastructural processes are implemented in order to minimize data frictions is still an underrepresented field of concern. If data acquire their meaning through their circulation along diverse infrastructural paths, then data frictions do not only concern data as the final outcome, but also the competing procedures through which they are generated. Section 2.2 thus introduces systems of integrated databases as technologies aimed to handle frictions about which configurations of actors, events and sources produce more reliable data.

2.1 The Syntagmatic and Paradigmatic Dimension of Data Circulation

As seen, the notion of data friction helps to uncover two dimensions of data circulation: data move not only between different actors and organizations, but also between different media and materialities. The structuralist notions of syntagm and paradigm can explain this difference without recurring to essentialist distinctions. In summary, we can say that in the literature underpinned by the flowing metaphor data circulation is mainly seen as deploying along the syntagmatic axis, while the paradigmatic dimension is less acknowledged.

Recalling the system vs. process binary, linguist Luis Hjelmslev (1963) distinguished between syntagmatic and paradigmatic functions that articulate the relationship between grammatical, phonetical or semantic items. Relations that link items along the syntagmatic axis are said to be combinatory: they align item A "AND" item B. Items are co-present. For example, the items "plumber", "faucet", "fix", "tape" are aligned along the syntagmatic axis in the sentence "the plumber fixes the faucet with tape".

Conversely, relationships deployed along the paradigmatic axis are of the type "EITHER…OR", that is, they are characterized by complementarity. Items in this case are never co-present, but can replace each other while respecting the consistency of the sentence. For example, "tape" and "spanner" can equally fit the slot X in the sentence "the plumber fixes the faucet with the X": one can be replaced with the other, and they are both variables that can be selected from a shared "plumbing dictionary". Figure 1 visualizes the two axes and the illustrative sentence.

Given its heuristic potential, this distinction has been applied to much diverse fields of analysis. For example, Jakobson (1960) has further developed it in the field of literary theory, by identifying the mechanism that underpins poetry texts with the co-presence along the syntagmatic axis of items whose relationship usually lies on the paradigmatic dimension of replacement.

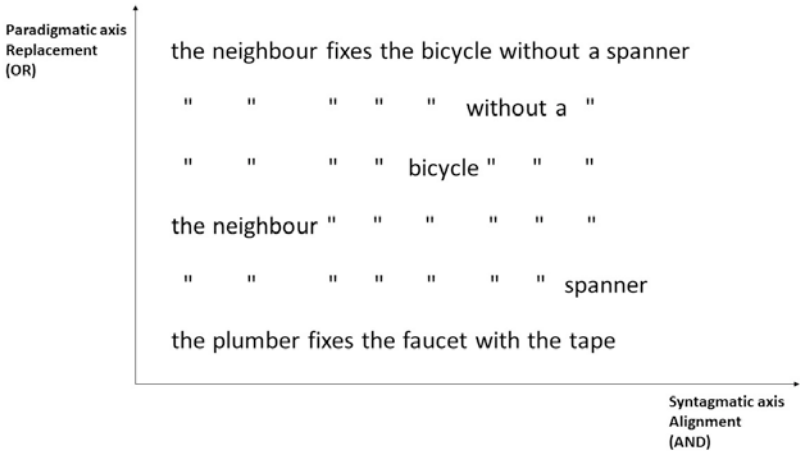

Fig. 1 – Syntagmatic axis of alignment and paradigmatic axis of replacement.

The paradigmatic and syntagmatic distinction has turned out useful also in translational studies of technology, in order to distinguish different types of displacements or "shiftings". Notably, Latour (1992) resorted to this distinction to describe the dynamics of a steel bar used to keep children in a safe sitting position while travelling on the rear seats of a car. According to Latour's analysis, the steel bar translates the parents' verbal orders to a disobedient son into an extra-somatic disciplining artefact. This translation from one kind of materiality (i.e., voice and sound) to another (i.e., steel) is labelled "shifting down" and happens along the paradigmatic axis of replacement. Conversely, the syntagmatic AND dimension ties together the actions actually deployed to reach the final goal of forcing children to a safe position (Latour 1992).

What Latour's analysis of the steel bar shows is that "it is impossible to move in the AND direction without paying the price on the OR dimension, that is renegotiating the sociotechnical assemblage" (Latour 1992, 172, caption to Figure 10.5). In a similar way, we hypothesize that a sound theory of data circulation needs to consider not only the alignment of infrastructural elements that allow data to flow, but also the new paths, procedures and potentialities that might arise from their replacement; and the mutual influence of alignment and replacement, their "price".

A close argument is implicitly given by Star and Lampland when they suggest that "slippage […] between a standard and its realization in action becomes a crucial unit of analysis for the study of standardization and quantification" (Star and Lampland 2009, 15). Bowker and Star further develop this point when they recall that "the slippage between classifications and standards on the one hand, and the contingencies of practice on the other, form core problematics both in the sociology of science

and in studies of use and design in information science. A rich body of work has grown up in both fields that documents the clever ways people organize and reorganize when local circumstances of their activities do not match the prescribed categories or standards" (Bowker and Star 1999, 293)

Despite their frequent references to linguistics, Bowker and Star explain this tension by recurring to the formal vs. informal binary. In an attempt to achieve a higher degree of abstraction and thus generalizability, we suggest that the slippage between standards and practices can be conceived of as a form of friction between different configurations of elements that struggle to replace each other. Therefore, the question arises about the price this replacement requires along the syntagmatic axis. The Dutch Kadaster case below discussed shows that it is impossible to renegotiate the sociotechnical assemblage of data circulation without stretching the length of the circulation path, the number of steps tied together in a linear sequence. That is, contrarily to but coherently with Latour's example, it shows that it is not possible to move in the OR direction without paying the price on the AND dimension. Before passing to the discussion of the empirical case, we nevertheless need to better introduce governmental interoperable databases as a key field of analysis.

2.2 Integrated Registers as Technologies for Data Friction Settlement

In 2008 Geoffrey Bowker observed that the replacement of past memories by formal information processing is one of the characterizing activities of institutions. "If we completely know a system in the present, and we know its rules of change (how a given input leads to a given output) then we don't need to bring to mind anything about the past" (Bowker 2008, 4). This obliteration of the past is carried on through standardization of institutional procedures whose goal is to discipline change. This is one way in which institutions can flatten data biographies and life trajectories.

The standardization of procedures is an explicit goal in governmental contexts, in which policy-making requires achieving a level of objectification and standardization of data that allows universal application, what is commonly labelled as "data quality". Such standardization is often pursued by developing complex integrated database infrastructures (European Commission 2013; OECD 2011; United Nations 2012). The first principle of the Whitehouse's "Digital Government Strategy", for example, states that "to harness [federal information] value to the fullest extent possible, we must adopt an information-centric approach to digital services *by securely architecting for interoperability*" (US Federal Chief Information Officer 2012, our emphasis). The rationale is that high-quality data can be obtained by replacing multiple, heterogeneous procedures for

data collection, update and distribution with a single one, thus reducing misalignment between differently generated data.

This is also the rationale underpinning the so called "systems of authentic registers" (Digitale Overheid nd). Systems of authentic registers are interoperable, hierarchically organized information systems in which government databases named as official ("authentic") sources – e.g., registers of persons, companies, cars – are re-used by other government agencies in the pursuing of their institutional duties. For example, welfare agencies might be allowed to use only personal data taken from a national civil register labelled as "authentic". Similarly, land registries and cadastres might be the only authorities entitled to provide geographical data to other agencies. These systems have the explicit goal of enhancing the quality of data by reducing all kinds of variations to a standardized version of the data, and their functioning is usually regulated by law.

Similar government systems are expected to comply with five provisions of an unwritten contract with citizens. A "government should: (1) not ask for what is already known; (2) offer quick and good services; (3) not allow itself to be misled; (4) know its facts; and (5) feed the community with confidence" (De Vries 2012, 9). The first principle concerns the circulation of data internal to the government apparatus, that should be preferred to continuously asking citizens for their data. The second and third principles refer to efficiency and correctness, respectively. The fourth to self-reflexivity, and the fifth to the outcome of complying with these principles, in terms of trust building. Consequently, systems of authentic registers are expected to benefit citizens and business (i.e., reduction of administrative burden, tailored solutions), government finances (i.e., cost reduced thanks to streamlining of data management), and government administration (i.e., higher efficiency in rules enforcement).

What is most important to our analysis, authentic registers are underpinned by a distinctive idea about what "data quality" is. While data quality is an umbrella term highly dependent on the intended use of data, and can thus only be defined according to variables related to situated applications (Pipino, Lee and Wang 2002), internal data consistency is a crucial parameter of data quality in authentic registers and government systems at large. "Quality", in this context, can be understood as the reduction of misalignments, "errors" and inconsistencies among data produced through diverse procedures, agencies and infrastructures (technical executive at Kadaster, see section 4 below). That is, quality refers to the reduction of multiplicity to unity, of multiple data trajectories to a single one.

Being aimed to enhance data quality under this specific understanding, we thus propose to consider systems of authentic registers as technologies to settle data frictions as defined by Edwards (2010). These systems are designed to minimize data misalignments, that is, discrepancies between data produced through different procedures. Therefore, they act as technologies aimed at establishing what should count as "data": which

configurations of actors, sources, agencies and events produce more reliable data.

By adopting a similar approach to standardization practices, new questions can be formulated. For example, what is the cost of similar friction settlements? Does any trace remain in data circulation of forced standardization of data and procedures? Is the past obliterated once and for all, or might it unpredictably pop up at later stages? In what follows we describe a case in which complex matching infrastructures are implemented to discipline change, enhance the quality of data and reduce data frictions. However, the case turns out to show that similar infrastructures do not completely silence frictions, but displace them along the chain of data circulation. This displacement requires, then, that further actions be undertaken to handle frictions; actions that "pay for" the replacement of old procedures with new ones with the alignment of new procedural steps.

3. Case and Method. The Dutch Kadaster: A Pioneer in Database Integration

The research on which this paper is based was conducted in the context of the "Translating Institutions" project funded by the European Commission's FP7 Marie Curie Actions. Data collection and analysis were carried on from September 2013 to August 2015 at the Dutch land registry: "Kadaster".

The Dutch Kadaster is a non-departmental public body, operating under the political responsibility of the Minister of Infrastructure and the Environment. It combines the functions of cadastre, land registry and mapping agency. It collects and maintains administrative spatial data about properties and the rights associated to them. In particular, it maintains the national cadastral map and register, the register of buildings and addresses, the topographical map database, and also the ship and infrastructures registers.

Being originally a government agency, Kadaster was turned into an autonomous body in the early 1990s. From that moment on it had to finance itself autonomously. To this end, it redefined its organization by reducing local offices, and redesigned its service provision policy. On one hand, it univocally identified its customer groups (i.e., civil-law notaries, local authorities, businesses, financial institutions and private individuals); on the other hand, it gave impetus to the creation of new services and programs oriented to those groups. A pre-condition to develop new services was the interoperability of Kadaster and other agencies' databases.

In the Translating Institutions research we focused on the very first of these integration programs, the one aimed at matching personal data

stored and maintained internally at Kadaster in its person records database (the *Kadastrale Personen Registratie* – KPR) with personal data from the municipal person register (*Gementelijke Basis Administratie Personen* – GBA, now *Basis Registratie Personen* – BRP). KPR contains the first names, family names, birthplace and other data of any owner of a property registered at the Dutch land registry (*Basis Registratie Kadaster* – BRK). On the other hand, GBA is the main source for personal data, a national database kept updated by the joint effort of all Dutch municipalities.

Since April 2007 GBA has indeed been classified by law as the "authentic" register for personal data. Since then the use of GBA-originated data has become mandatory for government agencies (and private actors accountable for public functions, e.g., notaries) in the pursuing of their institutional duties (Ministerie van Binnenlandse Zaken en Koningrijkrelaties – BZK 2013). In operative terms, this means that whenever the tax authority, Kadaster, or any other government agency need personal data in order to conduct their statutory activities, they are obliged to use data provided by the GBA database.

However, this law was only the point of arrival of a much longer process started in early 1990s. When at that time the Kadaster undertook the endeavour to integrate its KPR database with data from the GBA national register, the system of authentic registers did not exist yet. Conversely, Kadaster was the pioneer in developing database integration across government agencies at a time when few experiments in register integration were carried on. Twenty years later, a national system of authentic registers backed by law was issued, a new organization at Kadaster was set up, and – what is key to this article – a new definition of which procedures can be considered generating "reliable data" was established.

In the Translating Institutions research we reconstructed the trajectory that brought from the very first scattered experiments in database integration to this complex legal, technical and organizational scenario. To do so, we firstly analysed over thirty documents, including laws and decrees, technical and organizational papers, design concepts and schemas, web pages and system screenshots, in-house publications. Secondly, between 2014 and 2015 we conducted nine semi-structured and narrative interviews with technical (4), legal (3) and administrative (2) profiles at Kadaster, both at officer (2) and executive (7) levels. Interviews where audiovisually recorded, and pictures of schemas, drawings, screenshots used during interviews to illustrate the technical details were taken.

Reading of documents allowed the researcher to familiarize with the organizational context and the technical case in particular. It also allowed her to reconstruct the technical functioning of the integration process at different temporal stages. Finally, grey literature reading suggested the main topics to be addressed during the semi-structured interviews.

The interview format started with an unstructured narrative moment, in which interviewees could autonomously produce a self-generating story

of the GBA-KPR integration in the context of Kadaster. This solution was partly requested by interviewees themselves, who prepared self-presentations of the Kadaster and of the integration program, and partly responded to the need to preliminarily establish a trustful relationship between an outsider interviewer and interviewees who tended to strongly identify themselves with the organization. The initial central topic of narration – the changes brought about by the KPR-GBA integration along a 20-year time span – was relevant to both the informants and the researcher (Bauer 1996).

After the narrative interview, a semi-structured interview was conducted by the researcher, addressing the following set of topics: changes that using the KPR-GBA-integrated system has brought to the working routine of Kadaster personnel (both for the specific profile of the interviewee and other profiles), dismantling of old or introduction of new profiles required by the integration, main problems faced by the organization when implementing the integration, main trans-organizational problems (e.g., between Kadaster, notaries and municipalities), difficulties in framing and delegating problematic tasks and eventual solutions (if any), actors' preliminary knowledge and learning processes, opportunities for empowerment, specific technical details about functioning.

Analysis of the material collected was conducted firstly by identifying the main breakdowns (without *a priori* distinguishing among technical, legislative or organizational) identified by interviewees themselves. Then, all actors (humans or artefacts) involved in those problematic situations were mapped, together with the forms of knowledge they were endowed with. Finally, changes in actors/tasks patterns were identified. This last activity brought to a tripartite categorization of actors: existing actors who lost their functions and did not acquire new ones, existing actors who lost their functions and acquired new ones, new actors who were introduced thanks to their knowledge. This article reports only partial results of this thorough investigation, inasmuch as they are relevant to its main argument.

4. Cadastral and Personal Data Integration as Replacement of Bureaucratic Procedures

The integration of cadastral and personal data at the Dutch Kadaster constitutes the archetype of database integration programs as technologies for data friction settlement. In the early 1990s the use of GBA-originated personal data was identified as a possible solution to a set of problems concerning the quality of data stored in Kadaster's own person records database (KPR), and used in its internal processes. In the words of a Kadaster executive, "the integration of KPR with data from GBA has simplified things a lot. Before, we had a lot of problems with double en-

tries. You could have different names for the same person. With the GBA, procedures were simplified a lot and we got a higher quality of data" (technical executive).

For years before the KPR-GBA integration, the procedure to record new property deeds – and consequently vendors' and owners' data – in KPR had been based on the principle that the notarial deed was the leading official source. The deed was compiled by notaries using data taken for IDs and sent in both paper and digital format to one of the fifteen Kadaster production teams based at as many local offices. Each local office corresponded to one of the fifteen administrative areas in which the Dutch territory was subdivided. When recording a deed in the Kadaster land registry (BRK), production teams used to query in KPR the new owner's name, as it appeared in the deed itself, without further verifications. Since deeds were established by law as the leading source, verifications conducted by the notary at the moment of the stipulation were considered sufficient. Figure 2 visually represents this earlier procedure.

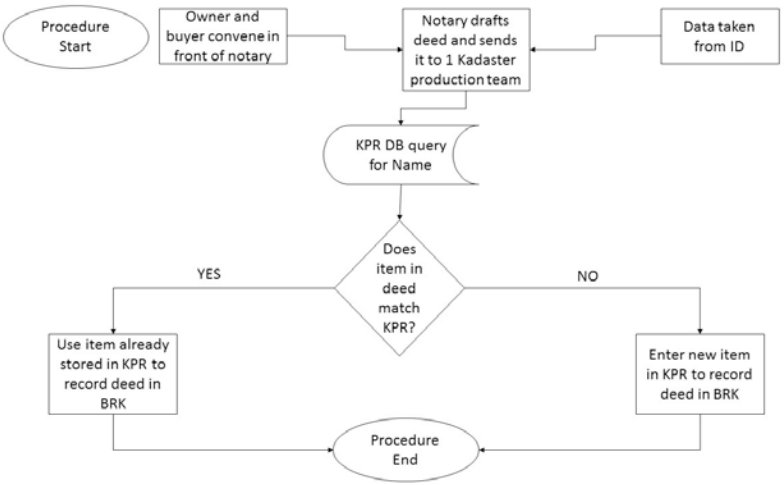

Figure 2 – Former integration procedure. Notarial deed is leading.

According to Kadaster personnel, this procedure could give rise to data misalignments or double entries. For example, if a person had already bought a property and her data had been entered in KPR at the moment of the first acquisition – but in the meanwhile her address, name or gender changed – in the case she subsequently bought another property, a different identity was entered in KPR. In order to avoid this and other misalignments among data collected at different points in time, the KPR-

GBA integration made available the personal data recorded by municipalities in the GBA register.

As Figure 3 shows, with the new system in a night batch all the names newly entered in KPR were sought for in the GBA database, according to a series of pre-defined search sets. If the KPR name matched a name in GBA, a "recipient indication" was entered in correspondence with that item in the GBA database. From that moment on, every spontaneous mutation in an item for which a recipient indication had been placed in GBA was automatically forwarded to KPR in a "push" mode. In case data modifications concerning one person occurred in the GBA, the recipient indication thus automatically generated an information flow towards the KPR, overwriting the previous data for that person.

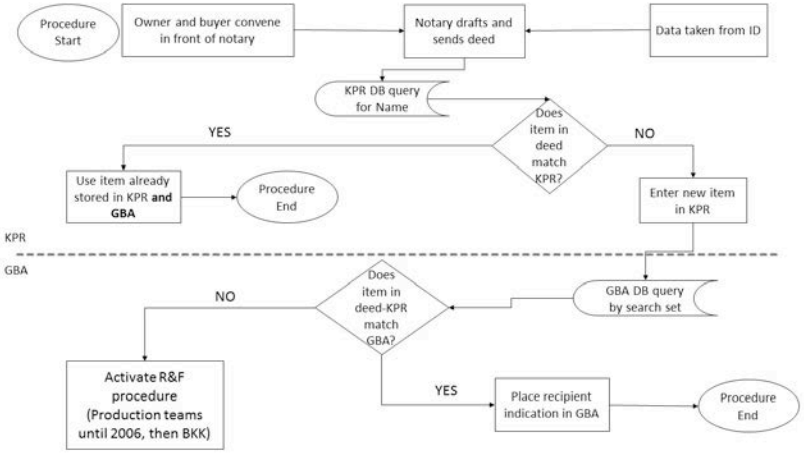

Figure 3 – New integration procedure, automatized.

As visualized in Figure 4, the mechanism of recipient indications established a permanent link between the KPR and GBA databases. This connection also made impossible for Kadaster local production team operators to further modify existing personal data in KPR. As a matter of fact, once a recipient indication was entered in GBA, a locking mechanism was triggered, so that Kadaster operators could not modify existing data anymore. By so doing, the KPR-GBA integration questioned the primacy of the deed as data source. While operators at local production teams continued to use deed-originated data when a new personal item was to be entered in KPR, those data could be overwritten as soon as a link with GBA was established, without for the operators to be possible to restore the original data from the deed. In other words, while with the

earlier procedure the notary deed was the leading source of personal data, with the new integrated system the leading source became *de facto* the GBA database.

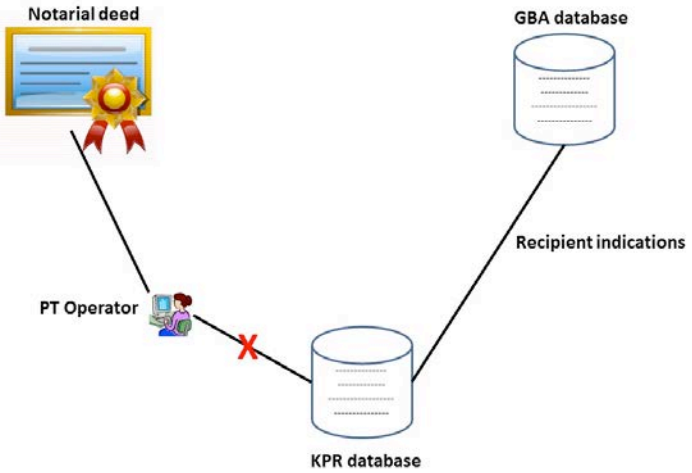

Figure 4 – Recipient indications mechanism. Local production team operators cannot modify data anymore.

The new system however did not only entail the replacement of information sources. Firstly, each of the two sources used to record different events: property passages formalized by notaries in deeds and processed by Kadaster local production teams, in the first regime; changes in name, address, gender, or deaths formalized by municipalities operators and updated in the national GBA node, in the second regime. Secondly, the two regimes involve different *actors and agencies*, endowed with different roles. In the earlier procedure the notarial class traditionally in charge of drafting official documents had a key certifying role, and operators at Kadaster local offices acted as intermediaries in charge of translating this certification into the KPR database. Differently, with the integrated system municipalities officers assumed a certifying role also for Kadaster, and human intermediaries were replaced by recipient indications and a "push" circulation mechanism. Eventually these replacements in actor/role patterns brought to a re-organization at Kadaster, with local production offices passing from fifteen to three (Pelizza 2016b).

Thirdly and summarizing, the new integrated system replaced existing bureaucratic procedures and established new data circulation paths. What indeed was at stake with the KPR-GBA integration was the identification of which configurations of sources, events, actors and agencies were expected to generate the most reliable data. In this regard, the KPR-GBA system of authentic registers is a clear example of controversy-handling technology aimed to settle data frictions. Being optimized to delete traces of the past in the form of non-updated data reported in deeds, and to assure constantly up-to-date data flows, the new integrated procedure was considered to be productive of the best data. The substitution of the earlier procedure with the new integrated one thus constituted at the same time a replacement of the process – i.e., the bureaucratic procedure – and of the outcome of that process – i.e., data.

4.1 The Feedback and Rectification Procedure: From Temporal to Procedural Frictions

However, not even the new integrated system was free from potential conflicts. Frictions arose between the two diverse procedures, which *de facto* continued to compete in establishing which events, actors and data circulation paths were to be conceived as producing reliable data. As one administrative officer put it,

> "those connections to us, the duty to use those data, complicate of course the process. We have to use those data in the registration, but the deed also has the right from the notary, so he [i.e., the notary] has also used those key registries, but when he does not do it right, then the connection from the deed to this database – and the connection from all other key registers to us – is not matching. That's it, the problem." (Kadaster officer)

Similar frictions are dormant as long as the two procedures overlap – that is, as long as the search set returns univocal items and recipient indications can be placed in GBA (see Figure 3, case "yes" in last branching). It is only when the search set fails to return any result (Figure 3, case "no" in last branching), that mismatches between the two procedures becomes visible. In this case, further mechanisms had to be activated to silence data conflicts.

The mechanism of recipient indications indeed lists a set of cases in which data derived from the deed and entered in KPR do not match data in GBA (see Table 1). In these cases the indication cannot be placed in GBA, and the data user is obliged by law to give a feedback to the data provider. This duty was established as a way to increase the quality of data. According to the legislation, if a government agency doubts the correctness of data, it is obliged to notify this doubt to the data provider, the one managing the authentic register (BZK 2013, article 1.7/2).

Cases impeding the placement of recipient indication in GBA:
a – When no or foreign addresses were indicated in the KPR, so that it was impossible to establish in which municipal GBA the search had to be run
b – when no person was found in GBA matching the search set provided by KPR
c – when more than one person were found in GBA, that match the search set provided by KPR
d – when an item found in GBA was subsequently rejected by KPR (which uses stricter control sets than GBA)

Table 1 – Cases in which no recipient indication can be added to GBA.

In order to comply with this provisions, Kadaster introduced a new feedback and rectification (F&R) procedure. This was initially delegated to the Kadaster's local production teams, and then to the Objections, Complaints and Quality Measurement team (*Bezwaren, Klachten en Kwaliteitsteam* – BKK). Team operators firstly checked that no misspellings had been introduced when transcribing the name from the deed to KPR. If this was not the case, then operators submitted a correction request to the notary, in order to exclude that the notary had introduced a misspelling in the deed at an earlier stage. In case the notary confirmed the accurate transcription of personal data onto the deed, a reasonable doubt about the correctness of data stored in GBA could be raised. It was only at this stage that the rectification procedure towards the GBA was activated. While describing the whole procedure would require a considerable amount of detail, for the goals of this article it is sufficient to highlight its extreme complexity, depending on the heterogeneity of cases.

Three aspects are important to note as far as the F&R procedure is concerned. Firstly, feedback and rectification constituted a brand-new procedure, *triggered by a previously non-existent form of knowledge*. As a Kadaster executive recalled in an interview, before the KPR-GBA integration, it was very unlikely that notaries or Kadaster operators identified discrepancies between data in the deeds and in GBA, simply because there was no formalized comparative procedure. Conversely, with the KPR-GBA integrated system the Kadaster is notified whenever it is not possible to place a recipient indication in GBA. This newly generated knowledge makes it mandatory by law for Kadaster to report back to the data provider, that is, to add a further F&R procedure.

Secondly, the F&R procedure was implemented in order to process diversions from the standard procedure, that is, the matching of the old and new procedures. The standard procedure was designed to automatically perform tasks without requiring human intervention. However, when deviations like those listed in Table 1 took place, human mediation

(either production teams or BKK operators) was called back to action, in order to allocate the exception to one of the existing categories, and re-establish order. In this sense, human mediation performs an interpretive, ordering agency, and it is only thanks to it that the standard can be re-established. In other words, while aiming to avoid human intermediation, the standard can exist as such only because its existence is guaranteed by human agency.

Thirdly, the integrated system does only streamline processes as long as data match. It is sufficient that notaries and civil servants at municipalities spell names differently (a very common case in the Dutch dynamic linguistic context), for conflicts between different data circulation paths to emerge. Similar discrepancies are indeed considered "errors" overflowing the standard procedure, not ordinary variations. Therefore, additional procedural steps have to be added in order to compose the mismatch.

Similar "errors" reveal that data variation is the norm rather than the exception. While high data quality is assumed by the promotors of the KPR-GBA integration as a normative goal, friction settlement constitutes the result of ceaseless attempts to erase traces of the past. In this sense, this case substantiates Bowker's initial insight that formal information processing works towards the replacement of memory (Bowker 2008). The KPR-GBA integration also suggests that the obliteration of the past is carried on at a cost, notably, a procedural cost: a further F&R procedure has to be activated in order to silence data conflicts.

In order to fully understand the implications of this result, we should consider that in the KPR-GBA integration the origin of data misalignment can be attributed to both variations across procedural steps (like the ones reported in Table 1) and across time. A Kadaster officer and an executive have stressed the interrelation between the two kinds of variation:

> [Officer] what also makes it complicate are the mistakes from the past.
>
> [Executive] Yes, that is also an aspect. In history some mistakes were made, that have an effect on these days. In the register there are errors from the past, from years ago.
>
> [Officer] Twenty years ago! Then you have to look it up, go back in history and look for the problem, and sometimes you have to change the deed that is behind that. So it is possible that the notary has to change deeds from years ago, to make a new deed, some application on it, because there were mistakes in the past. We are all repairing it. (Administrative officer and administrative executive)

In these words variations take place between data recorded in the past and current states of the worlds. As such, they bring about path dependencies that explain the mismatching of data between different procedural steps. To align similar variations in the present and in the past, further rectification procedures have to be undertaken. In the last part of this article we suggest that similar rectification procedures constitute a price

that pays in the currency of longer procedures the cost of replacing past multiplicities with a single, standardized present.

5. Syntagmatic and Paradigmatic Dynamics

In summary, the KPR-GBA integration illustrates a case in which the implementation of a system of authentic registers entailed a series of frictions about which configurations of data sources, actors and agencies, events can produce more reliable data. The new integrated procedure replaced the leading source (the GBA database instead of notarial deeds), the actors and agencies (municipalities instead of notaries and local team operators), and the events (any change in personal data, rather that property passage) that are involved in the production of high-quality data. As a consequence, new data circulation paths replaced earlier procedures, and the final data eventually turned out to be rather different from data previously produced through the earlier procedure.

This aspect became evident once the two types of data started to differ, and recipient indications could not be placed. Similar misalignments or frictions required the re-introduction of human interpretation and additional procedural steps in order to compose the mismatch. Notably, database integration produced a brand-new form of knowledge highlighting discrepancies between data in the deeds and in GBA. Before the KPR-GBA integration, that kind of knowledge did not exist, because there was no formalized comparative procedure. Conversely, with the system of authentic registers the Kadaster is obliged to deal with the new kind of knowledge and to activate a new feedback and rectification procedure. In this respect, the KPR-GBA system of authentic registers is a clear example of technology aimed to settle data frictions.

The KPR-GBA integration showed that it is impossible to completely silence frictions, and that friction settlement comes "at a cost". Here the cost is paid in the currency of a new F&R procedure, that stretches the length of the path for high-quality data production. This lengthening "pays for" the replacement of earlier procedures with the new one. In this sense, the F&R procedure displaces frictions along the chain of data circulation.

Recovering Latour's analysis of the steel bar (see section 2.1), a parallel can be drawn. While Latour's example shows that it is impossible to move in the AND direction without paying the price on the OR dimension, the KPR-GBA integration deploys a similar but inverted movement. It shows that it is not possible to move in the OR direction without paying the price on the AND dimension. It is not possible to renegotiate the sociotechnical assemblage of data circulation without stretching the length of the circulation path, the number of steps tied together in a linear sequence.

Figures 2 and 3 indeed show data circulation along the syntagmatic axis: a linear sequence of actions that use, recombine, query, match, enter, store, link and rectify data with the aim of obtaining a unique, indisputable, standardized item. However, this is not the only dimension along which change happens in this case. Figure 4 synthetically visualizes the replacement of an older procedure, a configuration of actors (i.e., notaries, Kadaster operators), roles (i.e., certifying, modifying) and events as data sources (i.e., properties buying and selling) with a newer procedure made of diverse events as sources of data, actors, roles. As in the previous example moving along the paradigmatic dimension gave the possibility of substituting "tape" with "spanner", so in the KPR-GBA case the replacement of notaries as data certifier with municipalities officers, of production team operators with the mechanism of recipient indications, of property registration with changes in name, address, gender and death constitutes a movement along the paradigmatic axis (see Figure 5).

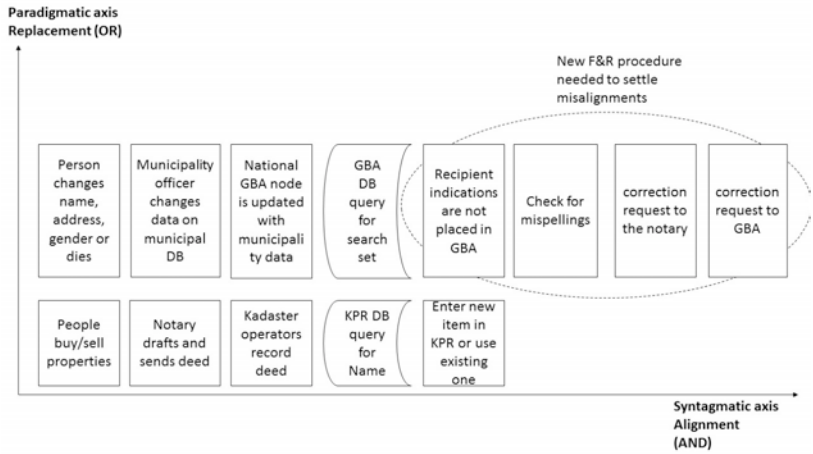

Fig. 5 – KPR-GBA integration along the syntagmatic/paradigmatic axes.

However, this replacement on the paradigmatic dimension requires adding a new, previously inexistent step on the syntagmatic axis. As above recalled, the feedback and rectification constituted a brand-new procedure required by the possibility to track misalignments in data between deeds/KPR and GBA. The replacement of older actors, roles and sources with the new formalized comparative procedure made it mandatory for Kadaster to report back to the data provider, that is, to add a further F&R procedure.

This is what we mean by saying that it is impossible to move in the OR direction without paying the price on the AND dimension, that the obliteration of the past is carried on at a procedural cost. A new F&R proce-

dure has to be activated in order to silence data conflicts that only with the new integrated procedure come into existence. In this sense, frictions are "displaced" from the paradigmatic onto the syntagmatic axis. Figure 5 visually reports this interplay between the syntagmatic and the paradigmatic dimensions.

6. Conclusions

The adoption of a semiotic, structuralist category of analysis represents an original theoretical contribution, adding a novel instrument to the STS toolkit for the study of data circulation. While the circulation metaphor usually takes into account the syntagmatic distribution of data along a streamlined channel, the KPR-GBA system of authentic registers highlights that a thorough understanding of digital circulation cannot avoid considering also the paradigmatic dimension of replacement. The KPR-GBA case has shown that the length of the circulation path is not independent from a complementary movement of replacement, that is, from which actors, sources, events are chosen to be assembled in the sociotechnical system of data circulation. In this sense, data frictions are "displaced", translated from the paradigmatic onto the syntagmatic axis: the price of replacement of old procedures with new ones is paid with a lengthened procedure.

All in all, reading the Kadaster findings in the light of the syntagmatic/paradigmatic binary contributes to the debate on data circulation in three respects. First, this research offers evidence to Bowker's (2008) insight that formal information processing eventually aims to flatten memory into a perpetual present. However, differently from Bowker and Star (1999), it does not explain this tension by recurring to the formal vs. informal binary. Rather, this research attempts to achieve a higher degree of abstraction by uncovering the structural mechanism through which formal/informal dynamics are articulated. Namely, it suggests that the slippage between standards and practices can be conceived of as a form of friction between different procedures – different configurations of actors, sources and event – that struggle to replace each other.

Furthermore, this replacement of old procedures with new ones – but also of the multiplicity of the past with a standardized and unified present – comes at a cost. Replacement requires a price in terms of stretching the length of the circulation path. New technical procedures for data circulation do not generate only more reliable, high-quality data, but also entail an expansion of the infrastructure and the roles, techniques and institutions supporting it. Interpreting this mechanism in terms of syntagm and paradigm allows overcoming the formal vs. informal distinction in favour of a more structural understanding that might be generalizable to very different cases.

Secondly, this paper enriches the discussion on data frictions by further defining them as controversies about which configurations of actors, sources and events are expected to produce more reliable data; and systems of integrated databases as technologies aimed to handle such frictions. Edwards (2010) himself acknowledges that data move along two dimensions: not only between different actors and organizations, but also between different media and materialities. However, Edwards does not explicitly theorize the difference between these two dimensions. Furthermore, once accommodated Edwards' frictions do not seem to leave visible traces.

Differently, by following frictions along the syntagmatic and paradigmatic axes, this research on the one hand conceptualizes the two different kinds of changes as happening either along the AND or the OR dimension. On the other hand, it shows that systems of authentic registers aimed at enhancing data quality do not completely silence frictions, but displace them along the chain of data circulation. Both these conclusions enrich the debate on data friction by suggesting a not so new, but forgotten tool of analysis.

Thirdly, this research contributes to the broader STS debate on data circulation by recalling two dimensions of circulation. It stresses that circulation does not only require that elements are aligned in the right order – as it is implicit in the flowing metaphor, but also that a specific configuration of elements replace other ones in a meaningful way. Furthermore, when this happens, the whole socio-technical assemblage need to be rearranged, since new forms of knowledge, procedures, actors and agencies are introduced. Since this re-arrangement implies the "payment of a price" either along the syntagmatic or the paradigmatic axis, we propose to replace the long-standing flowing metaphor that data circulation has inherited from early telecommunication theory, with a *payment metaphor*.

In summary, this article shows that – as in the biophysical world nothing is created and nothing is lost, but everything is transformed – so in data circulation the past, frictions, misalignment cannot be fully erased by deploying integrated systems that enhance data quality. Rather, data resist being reduced to standardized items. This resistance cannot be eliminated, but is rather translated, diluted into longer procedures, displaced along the syntagmatic axis. A longer procedure that includes new rectification steps pays the price of efforts to discipline change that cannot be fully silenced. This is a key analytical and theoretical insight for a theory of data circulation.

Acknowledgements

This work has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration

under Grant Agreement no. 326660, Marie Curie Actions Intra-European Fellowship for Career Development. This article however reflects only the author's views and the EU is not liable for any use that may be made of the information contained therein.

The author is thankful to *Tecnoscienza*'s editors and the two blind reviewers. She expresses her highest gratitude to Peter Laarakker (University of Twente, Kadaster), Gerard Leenders, Dinie Maas, Theo Splithof and the interviewees at Kadaster for their enthusiastic interest in this project.

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Liquefying Social Capital

On the Bio-politics of Digital Circulation in a Palestinian Refugee Camp

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Abstract: This article discusses the biopolitical dimension of digital circulation in the specific context of refugee relief. Drawing up on observational fieldwork conducted in Nahr el Bared, one of the largest Palestinian refugee camps in North Lebanon, it explores how the digital capture of social and spatial evidences fundamentally transforms the social capital invested in local knowledge, gradually eroding critical capacities for community self-governance. Building upon the concept of "data derivatives" developed by Louise Amore's, the article focuses in particular on the speculative dimension of data to suggest that the conversion of an embodied memory into data-based forms provides powerful means for rendering unsanctioned claims of ownership and belonging visible, actionable and effective. At the same time it opens up new modes of "probalistic containment" that restrict individual and collective life chances under the pretext of democratic participation and empowerment.

Keywords: Data derivatives; bio-politics; social capital; risk; speculation; political claim making.

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1. Introduction

Documentary evidence has been a key site of struggle for Palestinians. The forced creation of the state of Israel (1948) not only dispossessed the population of land, property and material assets but also destroyed vital cultural and historical resources testifying to the Palestinian experience. The long-term implications of this are most acutely felt in the more than fifty refugee camps spread across the Arab region. Managed by UN agencies and international non-governmental organisations the camps exist in

a political and legal limbo that left large parts of their social and spatial history undocumented or only partially accounted for[1].

The structural crisis of memory reached a new high when one of the largest camps in North Lebanon, Nahr el Bared, was completely destroyed in 2007. The event left deprived the refugees of all formal documentation to reclaim what they had lost. It required aid agencies and planners to drawn on oral testimonies from the refugees to retrieve the camp's historically grown spatial syntax so as to ensure the camp could be rebuilt similar to the way it was before. Over the course of two years, architects sat with each family to identify the exact size and location of refugee homes using satellite driven Geographic Information Systems (GIS) and participatory planning methods. The collaborative effort of mapping and reassembling Nahr el Bared turned data into a critical currency to retrieve lost property and assets. Yet, at the same time and in fact because of that very reason, the community's participation also became a site of severe power struggles as those, in control of vital information, were able to gain material and strategic advantages at the expense of the rest of the refugees. What's more, the digital maps provided aid agencies and government bodies with unprecedented access to the source code of the camp's lived an embodied memory with radical consequences for the ways in which this memory would henceforth be recorded and accounted for.

Taking the participatory mapping of Nahr el Bared as a starting point, this article develops an analysis of the specific modes of enclosure and containment afforded by digital circulation in the specific context of humanitarian practice. Drawing on the concept of "data derivatives" developed by Louise Amoore (2011) I explore how the digitisation and institutional processing of spatial and temporal evidences brought competing measures of risk, opportunity, security and value into collision, and embedded the refugees in an ambience of bio-political calculations that fundamentally undermined the refugee's ability to reclaim their historical achievements in Lebanon.

The informal nature of refugee property provides a suitable context to explore the tensions and contradictions involved when improvised social arrangements are captured into geo-spatial data sets circulating across social and technical registers. These tensions reveal how the expressive force of data – their ability to multiply and reassemble lived and embod-

[1] I don't mean to suggest that nothing has been written about Palestinian camps. To the contrary. Palestinian camps are some of the most researched places in the world. I am referring to the highly selective and fragmented collection of spatial and socio demographic data that has defined the work of international aid agencies and UNRWA, the main UN agency in charge of the welfare of Palestinian refugees. For an insightful analysis how refugees experience the over-exposure to academic scholars and self-appointed activists see Khalili (2007), Sukarieh&Tannoc (2012) or Allen (2014).

ied substance into new, derivative forms – can, on one hand, render unsanctioned claims of ownership and belonging actionable and effective while at the same time reconfiguring the very values, perceptions and meanings they engender and represent. My specific interest here lies in the modes of capture and escape that the conversion of lived and embodied memory into digital derivatives enables in an environment where institutional mechanisms of protection are largely absent or weak.

Derivatives, in their most basic understanding, refer to forms derived from another source. Data derivatives are a specific instance of such an inferences and can best be understood as the re-aggregation of disassembled data on the basis of coded association rules (Amoore 2011, 27). What is at stake in such moment of data-fication, I suggest, is not just the objectification of historically contingent social arrangements but a radical re-configuration of the networks through which mutual commitments and obligations are established and that sustain lines of trust, solidarity and the types of claims they occasion – both in a material and political sense. It's the transformation of these mutual commitments and obligations that I will be most concerned with in this paper and that the title "liquefying social capital" signifies.

Social capital, in the sociological literature, stands for the social knowledge and connections that enable people to accomplish their goals and extend their influence in a given setting. It involves useful social networks, trust and mutual obligations but also an understanding of the norms that govern behaviour and that enables people to act effectively (Giddens 2013, 855). These precious resources are of particular importance in informal settings such as Nahr el Bared where legal mechanisms and the institutional protection of rights and entitlements are mostly absent or compromised. In such conditions people depend by and large on informal networks and agreements to further their interests. To do this requires a careful management of personal contacts, knowledge and connections so as to ensure that someone's word or promise can sufficiently replace legal guarantees. The collective effort of mapping Nahr el Bared displaced this vital knowledge into institutional registers far removed from the day to day reality of struggle, opening them up to logics of exchange and calculation that put the collective desire to preserve the camp as political symbol and sanctuary in open conflict with desperate material needs.

2. Mapping, Empowerment and Community Cohesion

Scholars in critical geography have elaborated extensively on the potential and limits of participatory GIS in regards to community empowerment and democratisation. Participatory GIS draws upon the collaborative practices of action research that aim to transform power relations to the benefit of disadvantaged groups (Elwood 2006a, 199). One of its key

goals is to give voice to local populations and to put non-specialised knowledge on equal footing with expert regimes (McCall and Dunn 2012, 85). Yet, as numerous studies show, community driven GIS may give local publics an active stake in the planning process (Ventura et al. 2002; Abbott 2003; Sliuzas 2003; Elwood 2006b) but, as it does so, it also proliferates new ways of controlling the flow of data and knowledge which fundamentally undermines the promise of redistributing power back to local communities (Pickles 1995; Brodnig and Mayer-Schoenberger 2000; Elwood 2001; McCall and Dunn 2012).

There is, thus, an inherent tension between mechanisms of control and surveillance in mapping practices and the lines of resistance they occasion that can never be fully resolved. As Wilson (2011, 858) remarks, participatory GIS always involves both: a disciplining of local knowledge that encodes communal spaces according to its own logical standards while at the same time opening up new channels for contestation that provide local communities with the informational resource necessary to articulate preferred alternatives (Brodnig and Mayer-Schoenberger 2000; Elwood 2001; McCall and Dunn 2012). Against this backdrop it becomes clear that the production and circulation of spatial data cannot be understood independent of the matrix of strategic relations in which data is operationalized and actioned and that shapes the political production of self-knowledge as such (Wilson 2011, 585).

Foucault's concept of *bio-power* has long provided a primary reference point for the analysis of information as technology of power. Critics of humanitarianism have used it to describe the distinct calculus of life at work in relief operations, that puts aid workers in a position to nurture and abandon life through the management of calorie intake and the tracking of health indicators or housing conditions and the like (Fassin 2010; Feldmann 2012)[2].

Contemporary information technologies such as mobile communication, the internet, electronic surveillance, and communication satellites have radically expanded the capacity to control and manipulate life on the level of statistical calculation. Their ever expanding capacity to track movements, transactions, and desires in real time invested technologies of government with new anticipatory potentials which shifted the debate away from the probabilities of life as a general principle towards the specific modes of abstraction facilitated by predictive analytics and algorithmic governance. As Hansen (2014, 39) observes: "What accounts for the singularity of contemporary media is… that they impact experience on a

[2] The concept of bio-politics forms part of Foucault's (2003; 2008). Wider critique of sovereignty and juridical-political conceptions of power In its broadest sense it refers to the management of populations through expert knowledge: the counting, studying and defining of species and their productive requirements with the overall aim of legitimizing the state as central harbinger of the wellbeing of society as such (Lazzarato 2002).

much broader basis than consciousness. They literally seep into the texture of experience, forming a background, a peripheral 'calculative ambience', that indirectly flavors any and all resulting events or phenomena".

The main point to be taken away from these accounts for the discussion here is that data matters: both in the sense that they work on and through bodies, designs, objects and materials but also in the sense that they are generative of sensibilities, affects, and desires that escape human conscious yet that remain central to the production of social and cultural subjectivity nonetheless (Hansen 2014, 39). And yet, the datafication of human subjectivity also matters in yet another way, insofar as it multiplies and diffracts corporeal forms into liquid assemblages of informational properties and values that can be infinitely reconfigured, encoded and rearranged. Amoore's (2011) work on the use of algorithmically calculated risk flags in electronic border policing provides a vivid example here. Coining the notion of "data derivatives" she describes how border management systems particularize individuals into persons of interest by selectively re-assembling personal data into risk profiles – data derivatives – that are constantly updated and reassembled according to predefined association rules. These rules of association do not draw on the full spectrum of knowledge that exists about a person but are based on probabilistic calculations about possible movements, tendencies or behaviors that position individuals along preconceived risk scores. As Amoore (2011, 28) explains, data derivatives are not centered on who a person is or what the data actually says about her, but on what can be inferred and imagined about who she might be, according to algorithmically calculated probabilities. Thus, just like financial derivatives, data derivatives remain fundamentally indifferent to their underlying object. They project into the gaps and uncertainties of their own imagination as they render speculative scenarios into actionable form.

This capacity to create a new reality around an object, as Appadurai (2015, 231) suggests, constitutes a novel form of mediation, revealing its effects as a particular mode of materialization rather than representing pre-given forms. What materializes itself in data derivatives, in other words, is the ever evolving distance between a person and its data proxy that allows for the instalment of "ontologies of association" (Amoore, 2011, 27) in which mere assumptions and correlations between data fragments can be actioned into effective interventions or policies. Hence, it's not actual events but the probability of their occurrence that renders data derivatives operational and effective, irrespective of whether the assumed scenario in fact happens or not. In Amoore's (ibid.) words, it's the relation itself that renders data into an encoded course of action, assigning them a plane of actuality in their own right.

Building upon Amoore's work I am interested in the speculative potentials afforded by the selective assemblage of data fragments in Nahr el Bared. Thus I am using the concept of data derivatives not to describe algorithmically coded risk profiles but to discuss the particular rules of as-

sociation created by social and institutional risk calculations in the specific context of refugee relief. It's in this sense that I will use the term "probalistic containment" to refer to the specific modes of curtailment the production and circulation of spatial and temporal evidences enables as they are filtered through the political and strategic considerations of humanitarian actors and the state. I will show how they recalibrate individual and collective life chances on the basis of fluctuating norms they themselves engender as they bring different measures of risk, opportunity and value into conversation and encode lived and embodied knowledges along new governmental rationales.

In line with this approach I will not limit my contribution to this volume to the work of data derivatives within digital networks, but rather assess how their calculative possibilities diffract across social and technical registers, reconfiguring local environments along new communicative protocols. Following the lead of Lee and LiPuma (2002), I conceive of digital circulation as a productive surrounds – as a site of mutual transformation – in which the calculus of planning software articulates to social and institutional codes and calculations in ways that implicate digital flows in dialectics of historical struggle on multiple scales. At the heart of my discussion sits the question how data derivatives, as a specific instance of digital circulation, organize perceptions, movements and desires alongside their own speculative imagination and hold capacities for self-preservation in productive tension with the (self)-destructive impulses they entail.

3. About Nahr el Bared

Nahr el Bared is one of twelve Palestinian refugee camps in Lebanon managed by UNRWA, the main UN agency in charge of the welfare of Palestinian refugees. Located 16 kilometres outside Tripoli, in the North of the country, Nahr el Bared was originally established in 1949, one year after the forceful displacement of about 800.000 Palestinians in the course of events that led up to the creation of the state of Israel (1948). The camp moved the center of international attention in 2007, when a small group of militants, Fatah al Islam, attacked a checkpoint of the Lebanese army, just outside the refugee settlement. Eighteen soldiers were killed in the course of the battle. The reprisal of the Lebanese military resulted in three months of continuous bombardment that destroyed the entire camp.

Fatah al Islam forms part of a wider network of militant insurgents backed by regional powers who are eager to influence political events both in Lebanon and the Arab region at large. The origins of the group remain obscure but there is evidence to suggest that they were supported

both by Saudi Arabia and Syria prior to the outbreak of war there. [3] Fatah al Islam has no historical roots in Nahr e Bared and no long standing relation with the refugee population. Its presence, in fact, deeply divided the refugees and the political factions in the camp.

After sixty-eight years of exile Nahr el Bared has long outgrown its original size and location. The land originally rented by UNRWA did not exceed two-hundred thousand square meters and was soon not big enough to house the second and third generation of refugees. People started to expand, first vertically by building up additional floors; then horizontally, by buying up land in the immediate vicinity of the camp. Most of these extensions were never officially registered and exist in gross violation of national zoning regulations and building codes. These homes were often built on agricultural land or without building permit. And while on the level of affect and vision this area is unmistakably part of the Nahr el Bared's urban fabric, it has never been formally recognized as such. This raised great difficulties for reconstructing Nahr el Bared because the informal status of homes and businesses made it impossible to issue official title deeds for this part of the camp.

The precarious legal condition of property in and around Nahr el Bared is a direct reflection of the many paradoxes and contradictions built into the Palestinian struggle that have for decades defined the strategic role of the camps. Up until the 1980s the camps were widely regarded as a living testimony for the unresolved promise of return to the lost homeland. They provided both the grounds and horizon for national liberation in the political imagination of Palestine (Aburahme 2015, 207). The national pedagogy of resistance, however, required to insist on the camps as temporary shelter, even if only for the sake of maintaining grounds in negotiations about a future Palestinian state.[4] Yet the longer forced exile endured and the less progress was made in the Arab Israeli peace talks the more this insistence on temporariness took on the form of "cruel optimism" (Berlant 2006) – a sense of tragic attachment to an object that is effectively harmful to ones ambitions or cause. Arab nations have used the right to return as a pretext to deny the refugees access to full citizenship rights, arguing that this would undermine their political aims, while the Palestinian leadership at "home" has been reluctant to address the question of return altogether, postponing it to a point in time *after* the conditions for a Palestinian state have been defined.

The temporal paradox of "permanent temporariness" confronted ar-

[3] For a detailed account on the history and activities of Fatah al Islam see Gambil (2007), Rogier (2007) and Rosen (2008).

[4] Most refugees are well aware that they will never go back to Palestine and more and more show little inclination to do so. Yet holding on to the right to return nonetheless is imperative to them. Giving up on the idea of return would mean giving in to sixty years of systematic erasure of the Palestinian presence and is thus not available for negotiation or compromise.

chitects and planners with the difficult task of rebuilding a space that was never meant to last in the first place and to protect the material traces of a struggle whose political demands have become increasingly uncertain and unclear. Rebuilding Nahr el Bared, in this sense, involved much more then recuperating lost property and assets. It stands out as a collective attempt to reclaim visibility and recognition of a political community that has not yet been able to anchor its claims within the closed system design of Westphalian states.

Digital maps, in such a scene, can provide a powerful tool of "self-mediation" (Chouliaraki 2010, 228), in which the mere fact of a people "speaking out" about themselves can effectively replace institutionalized forms of claim making in the absence of legal guarantees. In the specific context of Nahr el Bared the maps opened up a plane of actuality that enabled the refugees to enforce senses of entitlement and belonging irrespective of their legal status and to reinstitute the camp as political space and territory through the very act of putting themselves back on the geo-political map. Yet the fact that for Palestinians such acts of self-mediation don't have a singular address also meant that their claims had to be relayed through a wide range of institutional registers that include: humanitarian agencies, international donors but also Lebanese governmental bodies, all of whom brought their own calculus of entitlements and needs, security and belonging to bear on the digitization of the camps spatial syntax and memory.

In what follows I explore how these competing registers of risks, responsibilities and obligations seeped into the textures of self-mediation. Building upon Amoore's notion of "data derivatives" I will describe how the circulation of data both multiplied and reconfigured the camp in line with military and humanitarian agendas and conjured up an ambience of calculative operation that fundamentally undermined the refugee's aspirations and goals. What I contribute to Amoore's analysis is an assessment of the destabilising potentials of speculative data proxies. Thus I will not limit my analytical focus to risk calculations at the hands of power, but explore how they can be utilized for more subversive and empowering ends. The extent to which data derivatives remain inherently indifferent to their underlying object does not necessarily work only in support of capture and containment but may equally facilitate a fundamental redistribution of the probable or the likely to the benefit of the governed in bio-political regimes. And yet, as I will show, this empowering potential was soon lost once data became a primary tool for securing power and material gains.

The main argument I am advancing can be summarized as follows: the selective re-assemblage of the refugee's lived and embodied memory into data derivatives encoded the camp's historical grown social and spatial syntax along new logics of risk, opportunity and value that gradually re-scripted the camp's social and material fabric along the pre-emptive logic of humanitarian mandates and the state. This had radical consequences

for the ways in which the social capital invested in the camp space could be utilized and rendered effective. It redirected the flow of information away from the site of everyday struggle, opening it up to a new calculus of responsibilities and obligations up to a point where memory itself was turned into an object of speculative trading among the refugees. The accumulative impact of these calculative operations deeply implicated the refugees in logics of "probalistic containment" that fundamentally undermined their shared vision to re-constitute themselves as political community and collective, while at the same time enabling some to accumulate power and material gains.

My argument builds on long term observational fieldwork conducted between 2007 and 2015. After 3 month of voluntary work for UNRWA's planning commission in 2008, I conducted 80 semi-structured and open ended interviews and 15 focus groups between November 2009 and November 2012. These interviews included all major stakeholders in the camp, starting with the refugees themselves, the leading architects and planners as well as state representatives, UNRWA and other international aid agencies, the Palestine Liberation Organization (PLO) and the various political factions in the camp. Additional information was gathered in town hall gatherings, at social events and public protests. And I attended the bi-weekly cluster meetings in which UNRWA coordinated its relief efforts with the rest of national and international NGO's and government representatives. The cluster meetings provided an ideal platform to trace the shifting power dynamics in the knowledge exchange between the refugees, the state and non-governmental actors and allowed me to closely monitor the political economy of data and information in the camp. Since 2012 I have been following up on events with annual field visits and direct updates from representatives of all sectors of the camp population. Prior to the publication of this article 8 additional interviews and 2 field visits were conducted between July 2015 and February 2016.

4. Reconstructing Nahr el Bared

Reconstructing refugee camps is challenging under any circumstances. What made matters particularly difficult for Nahr el Bared is the fact that after 68 years the settlement has grown into a large village with a full blown commercial infrastructure catering to the entire North of Lebanon. The camp had its own port, a thriving business landscape, ran its own mosques, hospitals and a diverse range of cultural and social institutions. Most of the socio-economic investments have been made in circumvention of national regulations, with many businesses operating from home premises without commercial licences or registered cars. The question whether and how to formalize the historical place and achievements of the refugees almost inevitable brought competing registers of legitimacy and need, ownership and belonging, risk and security into collision with

rather dramatic consequences for ability of the refugees to reclaim their historical achievements in Lebanon.

The Lebanese state had always made its approval to the reconstruction dependent on the possibility to reclaim sovereign control over Nahr el Bard and to put an end to the long-standing policy of non-interference in Palestinian internal affairs. At the same time, it confined its authority to questions of security and law enforcement, while outsourcing all social responsibilities, such as health care, schooling and housing provision, to UNRWA and international aid agencies[5]. These responsibilities are indeed at the core of UNRWA's legal mandate yet the obligation to rebuild refugee homes and businesses did not extend beyond the camp's original borders as established 68 years ago. This was painfully brought home to the refugees in the first damage assessment by the UN's satellite division, UNO-SAT, that compared the camps topography before and after its destruction during the 2007 war.

The aerial views occupy a curious temporal location. Instead of showing the camp in its current place, the damage assessment super imposed the settlement with a geo spatial grid that effectively repositioned Nah el Bared within its historical borders, reducing it back to its original size in 1948. This effectively cut the camp in half and divided the historically grown spatial syntax into two separate governmental districts, and two separate datasets. This enabled UNRWA to restrict its responsibility for rebuilding Nahr el Bared to the housing facilities inside its mandate area, while leaving those who settled outside its operational territory in a legal and political limbo, as neither UNRWA nor the state were under any obligation to rebuild this part of the camp.

The new boundaries in and around the camp are a direct reflection of the strategic imperatives that guided the entire reconstruction process and that fragmented the camp into a flexible assemblage of overlapping sovereignties shared between UNRWA, the Lebanese government and international donor states. Thus rather than reflecting the full spectrum of movements, transactions and spill-overs that defined the social and spatial fabric of Nahr el Bared the data collected in the damage assessment selectively re-assembled the camp alongside a matrix of calculated risks and responsibilities that moved the digital maps further and further away from the lived and embodied reality of the camp.

[5] The refugees as well as Arab states were always keen to establish a direct link between UNRWA's operational mandate and UN resolution 194, in which the international community committed itself to facilitate the return of Palestinian refugees to their homes and to compensate those who chose not to do so for the loss or damages to their property. This explains why the refugees do not necessarily disagree with the decision to leave all social responsibilities with UNRWA and not the Lebanese state. For a brilliant account of the significance of refugee status and ration cards for the emergence of national conscious and awareness among Palestinian Refugees see Ilana Feldmann (2007).

One of the primary concerns for the Lebanese state, next to preventing a permanent settlement of the refugees, was to contain the possibility of further militant attacks from armed groups inside Nahr el Bared. To contain this risk, the camp was enclosed behind five military checkpoints that policed all exits and entrances with a rigid permit regime. This not only curtailed the free movement of goods and people but effectively destroyed the vibrant local economy of Nahr el Bared as customers from outside were no longer able to access the camp.

The national consensus to pre-empt a permanent settlement of the refugees together with the new permit regime transferred most of the risks and responsibilities back to the refugees, nurturing the impression that they are held collectively responsible for the actions of a group that had no substantive connection to the camp. Confronted with these severe political, legal and military restrictions on all fronts the refugees soon came to realize that the war had not only destroyed precious homes, property and businesses but one of the their most valuable assets: the self-sufficiency, and independence they were able to establish through individual and shared investments in the camp. It took more than 3 years to negotiate a compromise that enabled those, who had settled outside the camps original territory, to obtain a building permit for conducting simple repair works. Yet this agreement did not extend to completely destroyed homes[6].

The risk calculus of UNRWA and the state provides a powerful example for the specific modes of "probalistic containment" facilitated by data derivatives in humanitarian operations. They selectively re-assembled the camps spatial history into new topographical arrangements that made the visibility and recognition of refugee property and people's eligibility for compensation ever more dependent on their legal status and their geographic position within the mandate territories of humanitarian actors and the state. This systematically reduced the number of possibilities for the refugees to rebuild their lives and futures and effectively confined the spatial and temporal horizons of their spatial memory to the legal and political imaginations built into the digital maps of the camp. The strategic indifference of these maps towards the historically grown reality of Nahr el Bared had far reaching consequences for the ways in which material and affective investments in the camp could be rendered effective. It facilitated a radical recalibration of the mutual commitments and social arrangements based on which camps spatial syntax had

[6] Sales contracts in Lebanon are only considered valid if they are registered with the state. The fact that hardly any of the private homeowners had registered their land acquisition in the national cadaster rendered the majority of buildings outside UNRWA's main mandate area illegitimate. The agreement with the government left about 100 fully destroyed homes owners unable to rebuild their homes leading many to simply pay off military officials to bypass the discriminatory policies of Lebanon.

developed, reconfiguring them alongside ontologies of association that reflected above all the strategic interests of aid agencies and the Lebanese State.

5. Liquefying Nahr el Bared's Social Capital

The precarious social and political situation of the Palestinian refugees has always extended the value of trust, local knowledge and friendship relations far beyond the interests and needs of individuals. This trust provided the primary backbone for the maintenance and reproduction of individual and collective life in an environment that has grown increasingly hostile to their presence and needs. Being able to rely on each other and to pool resources allowed the refugees to confront the day-to-day challenges of survival under conditions of structural invisibility and attrition. The gradual extension of Nahr el Bared into the surrounding villages gives vivid evidence of this. It testifies to the resourcefulness with which the refugee population has learned to circumvent their political and economic curtailment. Caught in-between the resistance to assimilate into the Lebanese body politic and the impossibility of returning, Palestinians gradually started to redirect their expectations away from the grand project of national liberation and to invest in their immediate future ahead. Their geographic position in one of the poorest regions of Lebanon, Akkar, next to the Syrian border provided a significant advantage here.

Akkar has always suffered from severe neglect by the central state administration. The shared experience of abandonment among Palestinian and Lebanese provided fertile grounds to build up a complex web of network relations, in which goods, services, land and infrastructures could be traded for money or through mechanisms of reciprocal exchange. Transactions between the camp and the surrounding villages were not confined to commercial activities, land sales, intermarriage and friendships. The first generation of refugees also introduced a whole new set of knowledge to the area, drawing upon its extensive experience in citrus and olive production to enhance local farming practices with new agricultural expertise. These day to day interactions enabled the refugees to extend their presence further and further into the neighbouring villages turning emergent needs and aspirations into a powerful medium for the camp's further growth.

Against this backdrop the informal extension of Nahr al Bared can be described as a remarkable historical achievement. It delineates a space of opportunity that hardly any other camp in Lebanon was able to establish. It's unique economic success made it possible for the refugees to reinsert their lives into a matrix of possibility of their own making, in which horizons of expectation were no longer dependent on the financial capacities of international aid agencies and donors but on their own entrepreneurial spirit and creativity. The war of 2007 severely disrupted this real time

economy of goods and favours and exposed the camp to a whole new set of strategic calculations that no longer corresponded with the refugee's immediate aspirations and needs.

The rigid checkpoint regime rendered time honoured social contracts and arrangements between the camp and its neighbours ineffective. Unable to rebuild their strong socio-economic ties left both populations ever more dependent on humanitarian aid and emergency funding, turning what was once a self-sufficient community of destiny into passive recipients but also into active rivals in the political economy of humanitarian aid.

The data collected on Nahr el Bared provided the key technology for this redistribution of opportunities and potentials. It provided the state and humanitarian actors with access to vital information that had never been available to them before. The circulation of data on each family's socio-demographic condition, income and property between funding agencies and governmental bodies allowed to directly monitor and control the distribution of resources and potentials and to re-align individual and collective interests and aspirations in accordance with the political and operational mandates of humanitarian actors and the state. Members of the former "camp elite", who were able to acquire private property outside UNRWA's mandate area, suddenly found themselves in the weakest position. The informal status of many land and business holdings not only obstructed the repair and reconstruction of homes or businesses but also posed severe obstacles to the distribution of international funds. This tied the refugee's capacity to retrieve past investments in the camps social and material infrastructure ever closer to information exchange networks far removed from the necessities of day-to-day survival, leaving the refugees with little or no control over the benefits and values of their investments in the camp[7].

The displacement of local knowledge together with the newly imposed economic dependency severely undermined the long-standing commitments and mutual obligations that had stabilized social differences and relations in the past. These relations were by no means harmonious or grounded in a shared belief in social equality and community cohesion. To the contrary, Nahr el Bared was known for its competitive and self-exploitative business culture, yet the accumulative impact of these individual investments always also nurtured the interests and needs of all residents in and around the camp. Nahr el Bared had around 1.500 local businesses providing thousands of jobs for the refuges. The sudden in-

[7] That, together with the fact that, since 2001, Palestinians can no longer own property in Lebanon, left refugees without any legal mechanism to rebuild their assets and to formalize their presence. It took more than 3 years to negotiate a compromise with the Lebanese government according to which simple repairs works could be conducted without sales contracts and building permits, yet this did not include the full blown reconstruction of completely destroyed homes.

flux of aid agencies and law enforcement relayed these potentials into the augmented sphere of calculated risks and potentials, that made the return of investment in the camp's social and material infrastructure contingent on fitting into institutionalized registers of eligibility and need. Caught in this new state of instituted paralysis the refugees quickly adjusted their strategies and tactics to the new raison d'état and started to skilfully exploit the ever-evolving distance between the calculus of rights and entitlements driving the reconstruction process and their actual aspirations and demands. The intense negotiations between the families and planners about the size and design of their new homes in the UNRWA mandate territory are instructive here.

6. Data Derivatives as a Source of Value Creation

Homes with the number of family members born into a house. With each new married son, an extra floor would be added to make room for the newlywed couple. These informal extensions were not just about accommodating to the natural growth of the population. They maintained an unspoken social contract between family members of different generations. Each floor added, were two extra pairs of hands to count on in times of hardship and old age.

The mapping process radically changed these fluid and flexible arrangements, as architects and planners started to divide each building into individual residential units and to assign each one of them to a distinct member of the family. This made it easier to organise the planning process and to distribute material gifts from donors, i.e. doors, bathrooms or kitchen sets. While grateful for the support they received, the camp residents soon started to complain that their homes were divided into itemised objects on an abstract planning grid. Some perceived the spatial rational of the planners as an unwanted intrusion that disrupted the unspoken contract of reciprocity and mutual obligation on which collective ownership of a family home had been established in the past (Interview, Nahr el Bared, May 22, 2010). Others quickly seized the opportunity and happily divided their homes into as many units as possible, so as to maximise their potential for compensation checks[8]. This created a gross imbalance in the distribution of payments and generated a lot of anger and frustration among the refugees.

The rasterized planning grid of humanitarian agencies and planners fundamentally rearranged the ontology of association that had defined

[8] Such checks were issued by UNRWA to replace lost furniture. The total sum of money available was calculated per residential unit and not according to the size or need of individual families. Thus, a home defined as one residential unit, housing a family of thirteen, would get one check, while a house composed of four units, with only two people living in each, would get four checks.

senses of ownership and belonging in UNRWA managed housing compounds. It effectively recalibrated rights and entitlements along a liberalist model of propertied citizen-subjects that stood in harsh contradiction to the practice of sharing and co-habitation that defined people's sense of ownership in the past. Yet, the refugees were by no means just passive victims but deeply implicated in the gross injustices and imbalance created by the reconstruction regime.

The ambition to make people's personal memory the primary basis of planning always carried the risk of encouraging gross exaggerations and tactical manipulation by the refugees. The mere fact that they were included in the planning process, after all, was by no means a guarantee that the information they provided was in fact valid and accurate. Many overstated the value and size of their homes and businesses making it necessary to carefully check and evaluate people's personal accounts against the testimony of friends and neighbours. The final verdict over a family's property lay in the hand of community elders who spearheaded the validation process and mediated in case of conflict or contradictory reports. Yet their judgement turned out not to be reliable either, as UNRWA soon received complaints that some residents were forced to sign off on less space than they actually had. Some of the community elders had used their mediating power to their own advantage and redistributed available square meters from one family to another in exchange for favours and status rewards. This required to revalidate all information provided by the complaining parties and to find a fair mechanism to compensate them for their loss. As one of the planners later remarked: "The validation process has slowed down the reconstruction tremendously and wasted vital resources of time and money UNRWA never really had" (Interview, Beirut, September 10th, 2015). The tensions were in the end resolved by offering all those, who had lost substantive amounts of space, additional square meters in buildings still under construction. They were of little practical use to the affected families and hence were quickly sold to the future owners of the respective homes. The price of one square meter could climb up to US 300$, according to one engineer (Interview, September 10th, 2015).

It's here where the data derivatives reveal their effect as highly ambivalent platform of self mediation. The circulation of social and spatial data not only realigned individual hopes and expectations along competitive principles of value creation but redirected modes of attunement away from the shared commitment to preserve Nahr el Bared, turning people's affective and material investment in the camp into a key asset to secure individual advantages, power and control.

Up until today UNRWA has not been able to secure the total budget needed to rebuild Nahr el Bared. Out of the total projected cost of $345 million only 58% of the funds have been secured. This meant that 50% of the refugee homes remain uncompleted, leaving the future of about 2.000 families, 10.000 people, unclear. 8 years into the reconstruction in-

ternational donors have long directed their attention away from Nahr el Bared to support new, upcoming crises, such as the massive influx of Syrian refugees into Lebanon. Against this backdrop the prospects of finishing the reconstruction of Nahr el Bared appear rather unlikely. It remains uncertain if the remaining homes will ever be rebuilt.

7. Concluding Remarks

To address one's participation calculatively, as Allen Pottage (2010, 123) remarks in regards to collaborative research, is much more significant in the replication of contemporary bio-power than conventional forms of sovereignty: "It instrumentalizes the notion of freedom as a medium for its own curtailment and disguises intentionally placed mechanisms of constraint behind a rhetoric of collaboration and choice". In this paper, I have examined how this replication of bio-power is further amplified by the speculative potential of data generated through participatory mapping regimes. The inclusion of populations in the production governmental data, as the example of Nahr el Bared shows, certainly decentralises power over-life to the benefit of the governed but it also opens up new forms of subjectification that render participants into active accomplices in the political optimisation of individual and collective life chances under the pretext of inclusion and empowerment.

This inherent ambivalence calls for new concepts and approaches to understand the specificity of calculative manoeuvres afforded by digital circulation and its bio-political effects. Extending the Foucauldian concept of bio-power I have conceptualized these effects as a distinct mode of "probalistic containment" in which the source and authority of governmental rationalities is displaced into the realm of speculation and, hence, inherently uncertain and unclear. Thus "probalistic containment", here, refers to the specific modes of curtailment afforded by the selective assemblage spatial and temporal evidences into data proxies once they are processed through the risk calculus of humanitarian actors and the state. In the specific context of Nahr el Bared it revealed how digital maps multiplied the number of possible states in which the camp come to exists and was able to reaffirm its place as a social and political location, while at the same time opening them up new forms of enclosure on the level of calculated risks and potentials that fundamentally undermined the refugee's existence as autonomous, self-sufficient political community.

Collectively held knowledge is one of the most precious resources available to populations who have little more than their memory to affirm their existence on the geopolitical map. It constitutes a critical domain of sovereignty in the realm of self-narration that allows those, who have so far been deprived of political autonomy and self-determination to control how they become visible, recognisable and addressable as stakeholders, constituencies and political force. The collective effort of mapping and

reassembling Nahr el Bared certainly increased these potentials by adding new layers of materiality to the camp space and enabled the refugees to convert their structural invisibility into an actionable presence in data-based form. The fundamental indifference of data derivatives towards their underlying object afforded the camp population with new tactical manoeuvres to enforce unsanctioned claims of ownership and belonging and to transform long standing legal and political deficits into moral obligations through which the lack of legal protection could be compensated and redeemed. Yet this ability to create a whole new reality around the camp's historically grown spatial syntax also made room for a series of new contracts to be established that rendered everything that escaped the calculative register of the state and humanitarian actors illegitimate, inactionable or ineffective, and thus obsolete. These rather ambivalent effects were neither inevitable nor a sole function of the speculative potentials afforded by digital maps and data. They rather reflect how the procedural frictions between social and computational logics of measuring, counting, and envisioning communal space articulate to the calculus of risks, responsibilities and obligations of humanitarian actors and the state. In the case of Nahr el Bard, these tensions not only facilitated a radical rezoning of the camps territorial borders but afforded a radical re-scripting of actions, expectations and imaginative horizons that deeply implicated the refugees in the gradual erosion of their collective bargaining power *vis-a-vis* UNRWA and the state. The conversion of lived and embodied memory into digital aggregates, in this sense, went hand in hand with a radical transformation of the social and strategic capital invested in the camp space. It conjured up an ambience of opportunistic calculations that turned memory itself into a tradable asset leading some to exchange time honoured, collective stakes in the camps history and future against individual advantages and material gains.

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Digital Literacy Circulation: Adolescents and Flows of Knowledge about New Media

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Abstract: The aim of this paper is to discuss the output of an empirical research on digital skills in order to develop a typology of skills circulation among young digital users. Relying on research on digital literacy in media studies and on users in STS, in this article we start criticizing the concepts of "digital divide", "digital inequalities" and "digital competencies". Then, we present the principal results of a research study involving 50 adolescents in Italy about how they acquired their competences in the use of digital media. This gave us the opportunity to focus on the digital skills of young people and the development of their abilities in using digital media. The research outlines the patterns of circulation in digital competences among young people in relation to family, school and peer group, defining four kinds of "flows": parental flow (involving fathers and mothers), peer flow (connected to friends and people of the same age), educational flow (referring to formal education) and technological flow (involving technological devices, such as computers, laptops, smartphones, tablets, etc.). The aim is to understand the interactions between digital skills and the social, institutional and technological conditions that influence the youth's digital literacy for the everyday use of digital media.

Keywords: new media; digital literacy; digital skills; digital inequalities; bricoleurs.

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> Buying the right computer and getting it to work properly is no more complicated than building a nuclear reactor from wristwatch parts in a darkened room using only your teeth.
>
> Dave Barry, *In Cyberspace* (1996, p. 39)

1. Introduction

Commentaries about new media often stress the development and diffusion of mobile and digital communication platforms and the increasing availability of technological devices. On the one hand, these commentaries describe ICT as instruments that generate important changes in interconnected and networked contemporary societies (e-vote, e-health, smart energy, logistic, transportation, construction etc.). On the other hand, these commentaries underscore the risks connected to an uncontrolled and incautious use of the web (privacy and copyright violations, telematics frauds, child pornography, enticement, etc.). 'Cyber-optimistic' and 'cyber-sceptical' are terms that define divergent frames that counterpoise democracy, participation, freedom and rebellion against control, authoritarianism and manipulation. It is a debate that reveals the necessity to understand the distinctive forms of use of digital resources and also the quality of the access itself, which allows users both to benefit from the opportunities offered by new media and to avoid the risks that so alarm public opinion. This is particularly relevant when we look at children and adolescents and their styles of ICT consumption (Buckingham 2007; Livingstone et al. 2011, 2014).

Our article proposes both theoretical and operational reflections on the concepts of *digital divide*, *digital inequalities* and *digital competencies.* Based on an international set of contributions (Hargittai 2002; 2010; Helsper and Eynon 2010; Liff and Shepherd 2004; Van Deursen and Van Dijk 2011), these concepts are the departure point to develop an empirical analysis around the skills of Italian adolescents and the improvement of their digital capacities. In this paper we describe the principal results of a research study involving 50 adolescents in the North West of Italy. This study reconstructs the patterns of circulation of digital competences among young people, in relation to family, school and peer group. The objective is to understand the connections between digital skills and the social, institutional and technological conditions which influence digital literacy.

2. Digital Divide and Digital Inequality

The term "digital divide" frequently assumes very different meanings. The origin of this term is unclear (Norris 2001; Gunkel 2003); it is used principally to express the problems connected with physical access to ICT, different forms of access to information, quality of available technology, technical problems related to devices, etc.. In fact, the concept is much more complex, as it relates to the different opportunities and uses of communicative and informational resources, which depend on traditional sociological variables, such as socio-economic status, gender and

age. From this perspective, it has emerged that today the younger generation is generally more active than adults and seniors in its use of computers and the Internet. Due to the costs of connection, a portion of the population cannot use the Internet, whilst those who are able to afford these costs are generally part of a more advantaged class; people with a higher level of education tend to connect to the web for longer periods of time, using its resources to do a much wider range of activities than those less educated; women are more excluded than men, etc. (Le Boterf 2000; Bolt and Crawford 2000; Bimber 2000; Bertot 2003). Di Maggio and Hargittai (2001) and Warschauer (2003) prefer to use the terms *digital inequality* and *digital inclusion* to underscore the transition from those who have and do not have the Internet to the analysis of what people do with the Internet and what they are able to do when they use its resources. Network society imposes the massive use of digital media, from which to be excluded is of course a source of inequality. However, the inability to use digital resources also represents a disadvantage. In line with this reasoning, Hargittai (2002) identifies a second-level digital divide to explain that the more people have access to digital media, the more important other factors become, connected to the ability to take advantage of informative, relational and participatory potentiality. Beyond the theoretical point of view, it is necessary to deal with a range of competences and skills, each related to technical aspects: the ability to move into digital spaces, to select information, to have a critical and proactive approach to the content mediated by digital media, to interact, etc. In this light, the notion of digital divide becomes a *continuum* of different unequal levels of access, usage and benefits drawn from new media. This continuum connects two hypothetical poles: on the one hand, the absence of access and, on the other hand, an efficacious use of technology. For understanding the changing role of social and cultural factors, we adopt a multidimensional and flexible definition of digital divide, declining it into the plural form of *divides*.

3. Literacy and Competences Circulation

As we have argued, the understanding of the digital divide as a continuum of inequality connected to a wide set of factors can help to encapsulate the digital revolution in terms of development, freedom and prosperity. Moving from this perspective, we should focus on the system of diffusion of knowledge, literacy and digital education for the individual. According to Van Dijk (2005), it is necessary that a more articulated ability to manage information and digital relationships is acquired, above the more basic operational skills which are necessary when using technological devices and software. Van Dijk discusses *informational skills*, connected to the ability to select and process information, and *strategic skills,* referring to the ability to use appropriate communication technology to

reach specific goals. In relation to young people, as we will examine in the next section, they are more familiar with digital media (Livingstone et al. 2011 and 2014) but there is the important problem of *critical skills* (Gui and Argentin 2011). Such skills – cognitive, informational, creative, cultural, ethical, social (Buckingham 2008; Jenkins 2006) – are deemed necessary to select and evaluate available resources. In order to respond to this wide and composite combination of abilities, skills and resources, the concept of *digital literacy* has been introduced, borrowed from a literacy concept that Aufderheude defined in 1993 as the ability to gain access, analyse, evaluate and produce a message through different forms of multimedia communication. Warschauer (2003) suggests that there are four simple skill groups: *computer literacy* (a minimal knowledge of hardware and software, operating systems and Internet surfing); *information literacy* (skills used to manage information obtained from the Internet, connected with an ability to look for, to select, to save and to archive information, whilst evaluating usability, reliability and trustworthiness); *multimedia literacy* (as highlighted by convergence demand, the ability to manage, understand and produce a multimedia environment where codes and languages interact continuously); and *CMC literacy*, representing the skills and competences needed to communicate effectively online (using e-mail, chat, Social Network Sites) and those needed to discern formal and informal environments. It is, perhaps, an easy way to observe and empirically track the ways in which digital media use may diverge across users. Eszter Hargittai (2007) proposes a more articulated subdivision, which explains the different levels of competency/incompetency that may be experienced by individuals. It includes: the effective and safe ways of communicating with others, a skill related to the ability to make adequate communication (for example, the ability to limit the risk of not receiving a response to an e-mail due to the object not being clear); the knowledge of how to contribute to group discussion and share content and, therefore, how to comment on a blog, to construct a mailing-list, to share User Generated Content and to contribute to the collective creation of a document; the knowledge of the use of tools and what is available online; the ability to access sources and judge credibility of messages, demonstrating the ability to determine the reliability of sources and to avoid phishing. There are then skills referring to online privacy and safety, which are the minimum skills used to avoid risks related to the diffusion of personal data; the knowledge of where and how to seek assistance, a skill connected to the capacity to ask for assistance with an online service and from other users; customization, being the ability to adapt and to personalise information. These models by Hargittai and Warschauer demonstrate how we need concepts and instruments to be able to fully understand the specificity of new media. It is necessary to explore and to engage flexibly with the problems and the innovative technological environments, whilst being able to read, select, interpret and evaluate information, also knowing how to interact with other people in a constructive and responsible way. These

models include skills connected to access, analysis, evaluation and participation, defining a new agenda for research and for policies. According to Livingstone (2009), there are still many questions to be answered. For example, can we determine the level of safety of communication? In a measurable manner, what does it mean "to contribute to a discussion group"? How can we evaluate the reliability of a source? According to the social literacies approach (Street 1995; Barton et al. 2000), discussion surrounding the level of literacy and skills acquired by individuals must not disregard the role of social practices, as they are connected to the way in which the individual resolves the problems with which they must engage. We gain skills from the way we engage with certain challenges and we explore beyond this. What we suggest is that people respond as social actors, inserted into a specific point of social structure with determinate resources (economic, cultural, and relational), connected to the experience of using technology, the accessibility of hardware, the use of software, as well as the evaluation of these online services. This fits with the well-known process of *domestication* (Silverstone and Hirsch 1992), a term coined to describe the integration of technological objects into daily life and, above all, the complex – circular and co-constructed – cultural dynamics within which users appropriate technologies. Literacy is not only connected to technical and neutral skills, but is a set of abilities obtained *socially* and *culturally*, producing a legitimacy and illegitimacy of knowledge content as well. According to Sonck et al. (2013) and Magaudda (2011), there is a circular dimension of the processes for the construction and acquisition of skills. Technology has inserted itself into existing social practices, adapting and shaping itself to the individual's needs, all the while creating a sort of inter-dependence between device and user. A relationship with a technological object goes inside processing and involves the rethinking, readapting and modifying of the technology, according to the contingent needs of the user. Fundamental actors in this process are the designers who participate in the circular dimension of users' literacy. From the beginning, the Internet expanded its audience to involve larger groups, who stimulated further changes in the use of the network. From primary software, which was less intuitive but less complicated to use, we arrived at the birth of more complex software, with the creation of applications and content, easily available information and, thanks to web 2.0, the opportunity for user participation in constructing such software. Literacy is a set of abilities socially and culturally obtained, connected to technical skills, producing legitimacy and illegitimacy of knowledge content as well (Winner 1980). So, the user is not an isolated individual, whose relationship to technology is restricted to technical interactions with artifacts: he is a part of a much broader set of relations than user-machine interaction, including social, cultural, and economic aspects (Oudshoorn and Pinch 2003). There is a circular process that is, in some ways, co-constructed, made by innovations and the reshaping of practices and technology where users play a complex role. We

would like to propose an observation of this process, regarding the role played by those who are considered most involved: young people.

4. Digital Literacy and Youth

Age is one of the most effective categories used in analysing the digital divide and we take for granted that it is negatively correlated with technology adoption. The generation gap may be decreasing, but it still persists. Older people rarely have the relevant skills or technical cognitive abilities necessary to use digital media and they have a reduced interest in learning or improving their knowledge relating to ICT. Born before the explosion of the information society, they usually experience the technological revolution in a passive way, without being involved in on-going processes and transformation.

Children and adolescents are the actors upon whom we focus our reflections regarding participation in the information society, whilst it is more usual to consider older people when speaking about e-exclusion. Terms used to describe the relationship between youth and digital media are varied: the web generation, the Internet generation, cyber-kids, etc. One of the most commonly used is *digital natives* (Prensky 2001; Bennett et al. 2008), used to identify those who grew up with new communicative technology. In opposition to this idea, there are the terms *digital immigrants*, for those who only approach new media later in life, and *late digital*, for those who regard technology with a kind of *technophobia*. The generation gap is constructed by specific skills requested by digital media. In relation to traditional media (books, cinema, television, radio, etc.), many adults would not favour the content consumed by young audiences (Riva and Cefalo 2014). However, they are able to switch on these media, they are able to use them and they could consume this content if they chose. In relation to digital media, operational and critical skills transform many parents into digital immigrants in the information society, where their children live as natives.

According to the media and popular opinion, digital natives and the *net generation* (Tapscott 1998) are the result of the effect of cognitive shaping, provoked by the spread and circulation of new technology. These have generated new thought and new styles of communication and learning. This view has merit, but as Mascheroni (2012) reflects, it oversimplifies the issue for two main reasons:

1. Studies and research on ICT use show that it is not age difference alone that determines the use and interpretation of digital content. As we stated earlier, these rather depend on classic factors connected to social stratification, experience of using content and the presence of digital media in everyday life. Digital natives, more correctly, are those who have used the Internet *for* a long time, *for long periods* of time and with competence. Therefore, this does not automatically mean young people and

does not only include young people.

2. Optimistic ideas that young people are naturally Internet experts just because they are young lead to the de-legitimation of political and educational actions aimed at educating young people about using digital media with awareness. It is clear that not all adolescents and children are able to cope with the risks that are presented by the Internet. Thus, it is essential that the necessary skills are discussed in order to stay safe whilst using digital media.

When using digital media, young people adapt themselves to the appropriate technology in a continuous and circular process, constructing experiences that enrich their own senses. The expression *bricoleur high tech* (Drusian and Riva 2010) proposes a different way to observe the appropriation process of digital media. Young people are able to take advantage of new and traditional media and combine them. They are able to move nimbly from SMS, to Facebook, to face-to-face communication, according to what they want to say. Young people choose the device most indicated to transmit a specific message in a determinate moment. It is an open process of bricolage, which is typically flexible, extremely adaptable, and that follows a never-ending succession of symbolic and instrumental changes. Where do these skills come from? How do they circulate between young people and older people? What is the role of the school in this process? What about technologies?

In the following pages, we present the results of a research study on the circulation of skills among young people themselves and among young people, socialisation agencies, technology, and the skills that these trends depict.

5. Methodology

The aim of the study was to understand how digital literacy circulates among young people and the reasons youths give for their choices and practices. The research focused on adolescents' everyday experiences and adopted an "adolescent-centric approach", where "methodologically and conceptually [adolescents] must be free from the process of containment that produces them as 'other' and continues to silence them" (Caputo 1995, 33). We chose qualitative methods to study the phenomena and the experiences of subjects, starting from their points of view (Flick 1998). Thus, the research adopted a semi-structured interview technique, with computer and smartphone support. During the interviews, digital media could be used by adolescents to better explain their experiences, using examples, opening their SNS profile, etc. Each interview lasted from 60 to 120 minutes. The empirical group involved 50 adolescents (25 boys and 25 girls), aged between 16 and 18, living in North West Italy and selected by a theoretical sampling approach. The principal criteria used to compose the sample were gender and age and we recruited participants

thanks to schools that permitted us to present the project to their students. Interviews were audio-tabbed and transcribed verbatim. The resulting data have been analyzed by ATLAS.ti software, using thematic analysis as a specific model of narrative analysis aimed at finding common thematic elements across participants and the experiences they reported (Riessman 2002).

As previously explained, skills are not only related to technological aspects, but merge with social factors, thanks to the possibility of involving people in the communication process (by UGC for example). By combining the findings of previous studies mentioned in the literature review section of this paper, which analysed qualitatively the skills connected to digital media (Hargittai 2007; Street 1995; Warschauer 2003), we have been able to create a typology of skills, made up by three distinctive groups:

- *Technical and functional skills* (connected to the use of software and hardware, to the ability to use a web interface, to use search engines, etc.)
- *Consumption skills* (connected to the ability to process information found on the web or content mediated by SNS, such as discerned information sources or the results of a query in a search engine.)
- *Creation and interaction skills* (connected to the ability to create content in a critical way, not just from a technical point of view, such as using Wordpress. Therefore, for example, posting a photo on SNS, evaluating the audience, the exposure of one's own data, etc.).

These different types of groups do not represent a mere simplification of more structured analyses, but attempt to establish a dialogue between careful theoretical distinction and the interviewees' narrations. The aim of this study is not necessarily to evaluate skills, but to better understand how adolescents create, modify, adapt and share these skills among themselves.

The analysis of the interviews allowed us not only to identify these three macro-groups, but also to define how digital literacy circulates (or not) between adolescents and their parents, adolescents and their teachers, and how it circulates in relation to technology. Looking at adolescents' everyday life, the analysis identified four different flows in the circulation of digital skills:

- *parental flow* (involving fathers and mothers);
- *educational flow* (referring to formal education);
- *peer flow* (connected to friends and people of the same age);
- *technological flow* (involving technological devices, such as computers, laptops, smartphones, tablets, etc.).

We adopt this distinction between different flows to show the findings of our research with the main aim of understanding how different skills circulate through these four flow patterns among adolescents and also with the purpose of recognising the existence of a broader system of knowledge circulation influencing digital media adoption.

6. Managing Flows and Circulating Skills

6.1 Peer Flow

According to the analysis, we can distinguish two different peer groups: close peer group and extended peer group (Scarcelli 2015). The first group includes peers that adolescents know in person, while the second group relates to subjects that young people may engage with exclusively through digital media (people that upload a video on YouTube or a tutorial on a website, for example). It is interesting to notice that, when adolescents speak about the extended peer group, the generational barrier crumbles. Even though the person who posts a video tutorial on YouTube or writes a guide on a specific website may be an adult, interviewees consider him/her part of their peer group anyway:

> I looked for how to install a game on my computer on a website…
> [Do you remember which one?]
> No, I don't remember… there was a tutorial, because I downloaded the game, it was not original. So I needed to understand how to crack it.
> [Who wrote the guide?]
> A guy…
> [How could you be sure that he was a guy and not a girl or an old man?]
> … I think he was a guy. Probably he was… Adults don't crack games… They are probably not able to crack them either…
> (Pietro, 16)

In relation to technical-functional skills, a small number of adolescents, mainly males, are used to activating the flow with the extended peer group in order to understand how to fix a problem or how to do a specific task. They prefer to try to find the solutions they need themselves. No one claims to have ever made a tutorial, guide or other content that could help other people on a technical plane. We can define this kind of flow as unidirectional, because it moves only from the extended peer group to the adolescent, without reciprocity. In relation to technical-functional skills, adolescents only activate a bidirectional flow within a small group, composed of boys whom they know in person and who have more advanced skills in assembling and disassembling computers, constructing websites, cracking videogames, etc. Some adolescents who take

part in these kinds of groups told us about an important flow that allows them to learn something new and to improve their skills:

> There are three of us. We love to "do experiments" with computers and to program them. Sometimes, we meet at my house or at Carlo's and try to find a solution together, to fix a problem for example.
> (Marco, 17)

Usually, those who have more advanced technical-functional skills become a point of reference for the peer group, who ask them for help when someone needs technical advice. Again, in this case, there is a unidirectional flow. On the one hand, those who ask for help frequently do not care about how to fix that problem in the future, because they know that there is someone who can do it. On the other hand, those who have advanced technical competences can close themselves off, preferring to maintain their position and avoid sharing their knowledge. There is a persistent gender segregation: interviewees speak about a male who has helped them with a computer problem, but never refer to a girl.

Peer flow in relation to content skill is absolutely poor. According to interviewees, for example, it is not necessary to learn how to trust internet contents. This is something that can be understood by simply comparing different sites when in doubt. Usually, interviewees do not know how search engines work and declare that it is a topic they never think about:

> I use Google. It gives you the results.
> [How is it possible?]
> What?
> [How does Google work, how can it give you lots of results and why is a specific result the first one?]
> Because it is the most correct.
> [So, imagine having to explain to me how to carry out research using Internet resources. I have to go into Google, fill in the form and I can use the first result to find what I am looking for?]
> Of course…
> [And there is no way to be totally sure that the information I find is totally correct?]
> Yes… you can open another two or three websites that Google gives you and you can compare those.
> (Luisa, 17)

Some interviewees do not know who can publish content on a website either:

> [Who puts the information on the website?]
> The owner of the website…
> [Can anyone write on the Internet?]
> No, first of all you have to buy the website… then you can write. But you can't write anything, there are some checks.
> (Christian, 16)

Production-interaction skills take part in the peer flow using the peer group as a judge of digital performance, mainly in SNS. In this case, the close peer group becomes an important landmark to understand what kind of behaviour is socially acceptable. We have to remember that, during adolescence, the peer group is very important. On the digital platform as in face-to-face interaction, symbolic sanctions become useful to define the rules of how to interact and to expose oneself through digital media:

> You know what is better not to put on Facebook… Photo, video, etc.
> [How do you know?]
> You know… there isn't anything written anywhere… but you can understand it… There are some things you know that you shouldn't do, like post your naked pictures. Then you know that, for example, when you are on Facebook chat, you shouldn't write a really long message.
> [Can you explain? Give me an example.]
> [laugh] Some months ago, I wrote a message to a friend and I wrote something really long… she took a screenshot and put it on her Facebook page, writing something like "When you wait for five minutes for your friend's response and then you understand why… Please Paola, take a breath!" She was not being rude, it was just a joke, but I understand… Then there are people that write phrases with just four words and then press enter [laugh]
> (Paola, 16)

Sometimes, in the peer group, stories of "wrong behaviour" circulate, which both define normal behaviours in the use of digital resources and compose shared rules. It is a plot outline that adolescents frequently repeated during the interview, changing only the subject of the story, who is usually someone that the interviewees do not know directly:

> There are some things that it's best you don't do.
> [Like what?]
> For example, send a video or a photo without clothes to someone… because then everyone knows you intimately [laugh]. It happened to a girl from Padova. Everyone has her video [laugh]. She doesn't live in Padova anymore… she had to go abroad because everyone knew her and her video…
> (Gianni, 17)

Peer flow, with the differences that we explain, remains an important flow for adolescents who, except for the content skill, continue to refer to the peer group (mediated and not mediated) as an important source for their behaviour.

6.2 Parental Flow

Another flow to emerge from the analysis of the interviews was the *pa-*

rental flow, which is connected to familial relationships and the way these intersect with the circulation of competences and skills related to the Internet. The research shows that it is a flow commonly neglected by the adolescent. The research underscores the persistence of generational distance between young people and adults, which is based mainly on the idea from both sides that digital media, especially social media, is something aimed solely at young people. In general, adolescents regard adults, specifically parents and teachers, as unable to use digital technology at all. This attitude is particularly prevalent when adolescents refer to their mothers, who were considered to be the most technically un-equipped member of the family by the interviewees. The discourse focuses more on the technical aspect than on the other uses of digital media:

> If you look at people like my mother, you can see that they are unable to use a computer, smartphone, etc.
> [What you mean when you say "unable"?]
> Someone has to stop them using the computer [laugh]. My mum asks for help every five minutes. She can't use a smartphone, she doesn't know how to send messages! Do you understand?
> (Michele, 16)

The parental flow seems to be unidirectional: adolescents could teach their parents how to use digital media in relation to technical skills, but they rarely ask their mother or father to help them. The exception is represented by the request to solve a technical problem connected to malfunctioning, which requires the intervention of an expert. In this case, we cannot speak about the circulation of knowledge, because the flow stops at the request. There is a gender difference in situations like this. Girls refer to their father, because they consider him to be capable of eventually finding a technical solution. In this case, we cannot refer to a fallacious flow, because there is no sharing of knowledge and girls close the flow, because they do not care. Some boys prefer to request help only if they are not able to fix the problem themselves; however, they do not ask their parent to fix it, but call a technician who is able to solve that problem. Thus, it is a financial more than a technical request. However, some of them are attracted by the knowledge of technicians:

> In my home, I am the technician. I fix computers, my parents' phones, I explain to them how to use software, etc. If it is outside my knowledge, I ask my father.
> [Is he able to fix technological devices?]
> Obviously not! But he has money to call the professional technician. I liked it when he came to fix the computer at home, because I observed him and I learnt something new. At a certain point, he started to ask us to bring the computer to his laboratory… in my opinion, he doesn't want me to learn more things, because he was afraid of losing a client.
> (Marco, 17)

As in the peer flow, we notice that some interviewees look at technical knowledge as a set of skills that could remain hidden and not accessible to everybody. In the rhetoric of Marco, for example, the idea that the technician would avoid fixing the computer in his own home is connected exactly with an imagined idea where technical knowledge has to be protected within the walls of labs. Only in a few cases do the adolescents seem to activate a flow of knowledge connected to the content of digital media. The interviewees that we can include in this group belong to families with high cultural capital:

> Sometimes, I ask my mother for some suggestions when I look for information on the Internet or we speak about where to find good news.
> [What do you mean by "good news"?]
> News that is true. My mum explains the more important news sites to me, such as Repubblica.it, Corriere.it. Sometimes I ask her to help me to understand if a news story is false.
> [How does she help you?]
> We check together on different sites, she knows the information world better.
> (Piera, 17)

In this case, parents are useful to mediate the content connected to school (research, information, news, etc.) but not connected to the sphere related to the creation of UGC that remains private and, according to the interviewees, has to be kept separate from parents.

6.3. Educational Flow

According to our analysis, adolescents are inclined to keep the flow connected to school closed too. This happens principally because the idea of the "adult as not competent" in relation to technology persists. In this case, one of the most recurring examples used by young people is related to the electronic grade book:

> Have you ever seen a teacher? When they open the electronic grade book? Or better, I have to say, when they try to use it [laugh]. My History teacher spends half an hour opening it and filling it in! It is not a problem for us, obviously! [laugh]
> (Massimo, 17)

According to interviewees, the scholastic curriculum does not permit them to gain the knowledge needed for life in the information society[1].

1 As we are analysing the circulation of knowledge connected to digital skills, we will not go into depth in relation to what adolescents ask to learn about digital media. Briefly, we can say that the majority of interviewees declare that they would prefer their school to teach them how to defend themselves from external

The flow of knowledge is activated only in relation to technical-functional skills. It happens only during specific classes: computer science, technical education, and/or other classes into which a specific module is inserted on the use of particular software. Those who attend technical school obviously dedicate more time to the study of programming or technical issues. However, with different levels of attention related to the kind of school, the scholastic curriculum usually seems to focus on what we define as technical and functional skills:

> I am studying to become a programmer... They teach me to use software and to construct software, computer languages to program, etc.
> [Do you ever speak about other things, such as social network sites?]
> No, never… maybe they say "Facebook" to give an example of an application that we can create, but no more.
> (Federico, 16)

Trying to improve consumption-interaction skills seems to be a prerogative of some professors teaching Italian or History, who might talk about a news source and the Internet. However, it is a rare occasion, according to what interviewees claim:

> We never speak about computers or the Internet during class… just when we have to use Excel. Or a few years ago, Prof. *** [surname of the teacher] did a lesson about the difference between the newspaper and news sites. But just one lesson. It was interesting… I don't remember anything. [laugh]
> [What did Prof. *** teach?]
> Italian.
> (Giuseppe, 16)

Regarding creation skills and discourses connected to them, adolescents describe school as a static reality. Formal education does not seem to deem dealing with the experiences of youth (how they use digital media to interact or to communicate) as important. Therefore, it is limited to the teacher's judgement whether these issues are discussed, usually in the form of commentary on news underlining the risks of the Internet or digital media, in general.

Sometimes, interviewees report that this task has been carried out by an external expert within a short project on media education. Teachers barely speak about the digital media dealing with social aspects; more frequently, they remain in the educational and normative sphere:

> Do you know about the girl that killed herself near here, in Cittadella?
> [Yes, I know.]

attack rather than from problems related to the sharing of personal data, always on a technical level (use of anti-virus, anti-malware, etc.).

Last year, the teacher spoke to us about what happened and asked us if we were using ask.fm. She said that it is not good to be anonymous, to offend people, etc.

[And you? What did you do?]

We listened to her… someone tried to say that that girl probably had problems, but she said that the problem was that some people are able to speak with each other anonymously… behind the monitor…

(Carlo, 17)

In general, interviews define the school flow as unidirectional. When we spoke about parental flow, we described this characteristic as something that "pulls" the knowledge from the adolescents to the parents. For school flow, the direction is inverted and goes from teachers to students, following the traditional vertical socialisation process.

6.4. Technological Flow

Interviewees rarely refer to technological flow in their narrations. Regardless, it is important to mention what research allows us to notice, because, for the process of improving skills, this flow has an important role. As we note, the different flows that we describe are frequently weak and adolescents improve their digital media related skills through a trial-and-error process. Technological flow involves mainly technical-instrumental skills and creation-interaction skills.

When the interviewees spoke about digital media and the interfaces they use daily, they take for granted that they are able to use them, just because they are able to use these kinds of technology on a technical-functional level. It is important to consider two different aspects: the first represents a platform created by a company, where the operations of the user are limited, whereas the second is constituted by the possibility for the user to modify some parameters. At the first level, one finds an extremely user-friendly interface, which teaches the user how to use that platform in a unidirectional flow following the interface guidelines. In this case, adolescents seem to easily understand how to use applications or interfaces as they present themselves to the user. The second level seems to be neglected by adolescents, who frequently look at it as something for experts. One of the more explicit examples could be one connected to the privacy settings of social media. In this case, we can refer to Facebook, which allows the user to modify their privacy settings and to manage who can see what on their profile. Although they understand the intuitive actions that the platform takes on their profile page, the interviewees become lost when we talk about configuration settings:

[Do you know that there is a specific section of the Facebook website where you can change your privacy settings?]

Yes I know…

[Do you ever change it?]

No… it is difficult. I just "close" my page so strangers can't see my stuff, but that's all. The other settings are probably for the people that know Facebook really well.
[For example?]
The programmer.
(Enrico, 17)

The majority of interviewees claimed to prefer finding alternative solutions and to change their choice rather than change the setting of their SNS or other applications. Frequently, they consider technology as something static and so prefer to modify their behaviour. For example, adolescents usually do not create a specific list of friends on Facebook with which they share certain content. Instead, they prefer to write a post using a sub-code that only those aware of it can fully understand:

If I do not want some of my Facebook friends to have access to a particular image, I simply do not post it on Facebook.
[Do you know that you can decide who can have access to certain content on your Facebook profile?]
Yes I know, you can change the settings where there is the small wheel. But it is easier to decide what you want to post.
[And what if someone posted that photo on your profile?]
I'd kill him [laugh]
(Giulia, 18)

The technological flow is the one that can best explain how technology and society are co-constructed and how users readapt the established technical uses, re-shaping them according to their necessity. This kind of flow explains that technology and users are two spheres that we need to consider as entangled rather than separated (Oudshoorn and Pinch 2003).

7. Conclusion: Bricoleurs at Work

The analysis showed that adolescents' interpretation of their relationship with technology still is largely overflowing with technological determinism. Interviewees described a stereotypical image of technology as a field dedicated to specific social actors, typically young teenage boys. Young people's accounts reveal a *fil rouge* that insists on a specific definition of competences, framing them mainly within a technical domain. Moreover, adolescents' discourse marks a symbolic generational frontier between adults and adolescents, in which digital media represent the wall that divides the two groups. This symbolic separation defines the flows that we called *parental* and *educational*, which are mainly unidirectional and do not permit the spread or sharing of technical and social skills useful for life in information society.

On the one hand, the educational flow concentrates only on technical and functional skills and frequently considers a vertical transmission of knowledge based on formal education. Italian schools are still unprepared for the new challenges that digital media present (Calvani 2010) and adults' and adolescents' competences rarely merge in an educational flow. On the other hand, the process seems to be inverted for the parental flow. It is also based only on technical and functional skills, but envisages a transmission that goes from the adolescent to their parents. The symbolic separation between adults and young people could be functional for adolescents seeking spaces of autonomy (boyd 2014). However, it shows a broad gap, unable to consider the social side of digital media and its role in the life of the adolescent.

According to our analysis and in line with the studies discussed in the first part of the article (Hargittai 2007; Street 1995; Warschauer 2003), adolescents define, redefine, modify and improve their knowledge of digital media, mainly by direct experience and within the peer group. Technological flow, even if not explicitly mentioned by the interviewee, plays an important part in adolescents' experiences. They are, on the one hand, modelled by technology and, on the other hand, they redefine the technology itself. The technological flow shows explicitly one of the recurrent topics in STS and media studies: the mutual co-construction of technology and society that, as in the SCOT (Pinch and Bijker 1984) and the domestication approaches (Silverstone and Hirsh 1992), puts emphasis on user-technology relations. In the case of the technological flow, we find a clear example of how users shape and negotiate meanings and practices in technology use. Focusing on adolescent skills, we can see that adolescents deploy different skills every day in conjunction with technology, which allow them to participate in a rich way in the today's information society. Adolescents' experiences with digital media are based on a trial-and-error attitude, which still seems to be the most important way to acquire skills. Every day, scripts and instructions embodied by technology are reshaped and adapted by adolescents for their needs, especially in the case of technical-instrumental skills and creation-interaction skills. Some problems related to creation-interaction skills could emerge, as the adolescents' interviews showed little concern when using digital media to manage social interactions or self-presentation. Young people frequently tend to take the operation of digital media for granted. In this case, technology seems to be interpreted as too difficult to understand and so it is frequently considered as more rigid and difficult to adapt to specific needs. Rather than using technology and setting it to respond to their everyday needs, adolescents prefer to adapt their aims, finding alternative ways to communicate on the platform. In this case, the technological flow does not contribute to fostering skills and the adolescents prefer to reshape their activities rather than technology.

Even in this case, adolescents tend to interpret as the technical and the social as separate domains. The latter emerge when we consider the

peer flow, which mainly concerns the performance of adolescents through SNS and face-to-face communication. Comments, jokes, teasing, etc. function as activities that define the rules concerning how to interact and to expose oneself through digital media. This kind of flow remains within the peer group and extended peer group (Scarcelli 2014), establishing a common knowledge that becomes part of peer culture.

Far from confirming a deterministic image of media-competent adolescents, our analysis allows the figure of the *bricoleur* (Drusian and Riva 2010) to emerge. Adolescents use their own cultural and social instruments to combine different flows of circulation of competences and to create their own toolkits for using digital media. Taking into account the different flows that we described and the variety of skills necessary for life in an information society, our study looked closely at the relationship between technology and society as part of domestication theory and the social shaping of technology approach. Once again, contrary to the point of view offered by deterministic perspectives on media diffusion (the most cited example is the label "digital natives" – Prensky, 2001), we can define the sociotechnical construction of competences as something far from being naturally embodied in adolescents. The four flows that we described help to reveal how the circulation of competences is constructed in social context and interaction. As we have shown, the relevance of the competences' circulation does not seem to have been interiorised and accepted, neither in public debate nor from the adolescent point of view. The persistence of a view that considers digital media as a foreign entity, either in school or in the family, and the idealised separation between online and offline experiences, both increase the divide between generations and reduce knowledge flow that adolescents would understand.

By using the concept of social literacy and focusing not only on how adolescents use technology, but also on the circulation of competences, one might gain a better understanding of the processes of appropriation and use of digital media among young people. Research frequently focuses on the measurement of skills and institutional offers that permit adolescents to potentiate their competences. The four distinctive flows we described in this article could be relevant to better understand the circulation of competences involving young people, in processes where they are actors with agency, able to interact with other human and non-human actors. According to Lievrouw (2014), analytically combining tools from STS and media studies could be a fruitful way to embrace a more nuanced analysis, able to examine the circulation of competence in relation to all actors involved. It could be useful to bridge the gap between the technical and social, in public discourse, in educational practices and in everyday life experience, in order to build a clearer assessment of the different flows of competence relevant in new media use. This would reinforce the digital literacy of adolescents and help young people to compile the resources necessary to actively take part in information society. However, understanding the gaps in such flows does not mean to trace a nor-

mative path based on an adult perspective, but to give relevance to the *bricoleur* work of adolescents. It should be a co-constructive process, where the knowledge of both adults and adolescents can merge, maintaining their own specificity. In this way, social and technical expertise could converge and start to respond to the new challenges of today's information society.

Acknowledgements

This study was a joint effort by both authors, though Claudio Riva wrote paragraphs 1, 2, 3 and 4, and Cosimo Marco Scarcelli paragraphs 5, 6 and 7.

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From Linearity to Circulation
How TV Flow Is Changing in Networked Media Space

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Abstract: This article discusses the evolution of the concept of flow from the producer-controlled phase to the user-controlled phase, thus proposing the concept of circulation as a new framework for understanding the new TV ecosystem. The multiplication of screens (from the traditional TV set to handheld mobile devices) has made TV content accessible anytime and anywhere and, furthermore, has provided an interactive space where the digital life of content is managed by the audiences on social media. Such multiplication of screens has created forms of TV consumption that lead to the deconstruction and subsequent reformulation of the concepts of space, time and medium. This article examines this ongoing process, beginning with observations of audience consumption practices that are analysed using Osservatorio Social TV 2015, an Italian research project.

Keywords: TV flow; social TV; audience; digital circulation; networked media space.

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1. Introduction

Flow is not just a concept or something intangible and immaterial; it reflects the TV viewing experience and our perception of the medium. It is a complex set of variables that includes productive and distributive models, content structure and organisation and, above all, cultural and social practices enabled by a specific technological screen configuration. Although Williams ([1974] 2003) introduced the concept in the early 1970s, it has remained valid even now, when television (both as a medium and a device) seems to finally be converging with the Internet.

The original "disciplinary power" of television as a medium found its

expression in the linear form (*producer-controlled flow*) through which broadcasters managed their full control over the schedule, genres and audience experience (Ellis 2000b). The technological limits of the TV set and its user interface (remote control), in addition to constraints in the broadcasting systems (number of channels) and business models (license fee and/or ADV), have guaranteed the long-term success of the "planned flow" as "technology and cultural form" (Williams [1974] 2003). Accordingly, TV content had a top-down circulation, and content life was restricted by TV scheduling.

At the beginning of the new century (in the so-called "age of plenty"; Ellis 2000a) we saw the first major transition in television in the most developed markets. This phase led to some important changes such as new distribution systems, which provided an unlimited number of TV channels, and the introduction of a pay-per-view business model that transformed the medium in terms of content accessibility. The medium, therefore, becomes "an aggregator of a broad range of niche and on-demand viewing audiences" (Lotz 2007, 34), and flow is thus no longer a required condition for audience consumption. Even if the notion of flow has basically remained the default television structure on which the viewing experience is based, the disciplinary power of flow is substantially compromised for an increasingly large sector of the audience. Emerging technologies (such as PVR – Personal Video Recorder) produced an initial shift in the viewing experience; they changed the audience's relationship with the timetables of TV content by providing more access points.

The viewer-centred model started to become dominant as television progressively began to converge with the Internet and online distribution systems. Linear flow, which expresses the medium structuring power, is increasingly being replaced by a circular flow where the user – as in all other contexts characterised by technological convergence – becomes the center of the system. Place-shifting enhances the time-shifting process; the experience of television takes place in a plurality of multiple screens (personal and/or domestic devices) at different moments of the day, in accordance with the viewer's needs. Thanks to the interface of each individual device, control and choice features are completely in the hands of each user. Viewers can access TV content using different screens for different purposes (search, watch, share, and participate). In fact, multiscreening practices relocate the viewing experience within the *networked media space* (Chamberlain 2011); the set of connected and interchangeable devices (smart TV, smartphone, PC and tablet) that are currently available provide viewers with real-time access to audiovisual content and online platforms that enhance the TV experience.

We can therefore observe that linear flow as described above is no longer a default condition of the medium. However, we do not wish to assert that it is now only user generated (Uricchio 2010). As a matter of fact, new configurations of TV sets and the most innovative viewing practices have given way to the *personcasting* experience (Lotz 2007, 244).

However, this does not lead to fragmented and isolated media consumption. Instead, television flow may be perceived in terms of content circulating on different platforms, and audience participation in content creating and sharing within social media. In other words, this new conception of flow requires devoted audiences who actively consume television content and engage in its production on screens and technological interfaces where the flow itself is continuously renewed (actualised).

Thus the viewing experience overcomes the boundaries between different devices, distribution platforms, and content forms and genres; it actually results in an expanded creative process. At the same time, TV content has become spreadable (Jenkins et al. 2013) on various distribution platforms and it requires engaged audience participation to define and complete its value. The digital life of content and its circulation depend on both producers and consumers. Producers provide multiple "touch points" to make the content accessible, thereby focusing on multiplatform storytelling and audience engagement strategies. Consumers manage and improve the circulation of content by appropriating and sharing online meanings and pleasures connected to the consumption experience (Fiske 1992), and by expanding the television text beyond its pre-defined boundaries. Television flow can now be effectively understood as a content circulation process that takes place within a *networked media space*.

This article examines this ongoing process, starting with the observation of audience consumption practices. More specifically, we discuss these issues in relation to research data collected in 2015 by Osservatorio Social TV (http://www.osservatoriosocialtv.it/) that was concerned with transformations in the television viewing experience. Osservatorio, a research project that explores innovative audience practices from multiscreening to social TV, was established by the Sapienza University of Rome in collaboration with major Italian television networks (RAI, Mediaset, SKY, FOX Channels Italia, Discovery, VIACOM, Laeffe and AXN).

The research demonstrates that the TV consumption experience has become extremely diversified; the widespread availability of devices sets the stage for the coexistence of complementary audience practices. From traditional viewing settings (TV + sofa + broadcasting flow) to advanced scenarios based on mobile screens and personcasting, audiences are exploring – at various speeds and intensities – the increased accessibility of TV content and the spreadability of TV programmes. Moreover, user generated content production and sharing remediate the original TV content and begin a highly unpredictable circulation of the content itself. In other words, we are faced with a proliferation of consumption styles based on the circulation of content and programmes and on the extension of their digital life.

2. TV Flow: From Linearity to Circulation

As noted earlier, the concept of television flow was developed by Williams when the structural power of the medium was absolutely decisive. "In all developed broadcasting systems the characteristic organisation, and therefore the characteristic experience, is one of sequence or flow. This phenomenon, of planned flow, is then perhaps the defining characteristic of broadcasting, simultaneously as a technology and as a cultural form. [….] The difference in broadcasting is not only that these events, or events resembling them, are available inside the home, by the operation of a switch. It is that the real programme that is offered is a sequence or set of alternative sequences of these and other similar events, which are then available in a single dimension and in a single operation" (Williams [1974] 2003, 86-87).

The "disciplinary power" of the TV medium found its expression in the linear form (*producer-controlled flow*) whereby broadcasters managed absolute control over the schedule, genres and audience experience. Viewers only have to turn on the television and proceed to consume the flow of programmes, commercials, promotions and advertisements that are graphically attached to the identity of the channel (Ang 1991). The technological limits of the TV set and user interface (remote control), in addition to constraints in the broadcasting systems (number of channels) and business models (license fee and/or ADV), guaranteed the long-term success of the "planned flow" as a technology and as a cultural form. In other words, the producer-controlled flow expresses a type of "televisual *essence*" (Uricchio 2004, 234) that, in part, has survived some of the transformations of television and still maintains its imprint in the general channels of digital terrestrial TV.

This cultural, more than technological, essence is also related to the concept of "liveness" (Couldry 2004), which is closely related to the idea of linear flow television. Such flow, therefore, became the symbol of the power of television and its ability to colonise imagination and consumption practices while building a collectively shared liveness that reflects the ideological dimension (or "false consciousness") of the medium itself. Williams regards it as "the replacement of a programme series of timed sequential units by a flow series of differently related units in which the timing, though real, is undeclared, and in which the real internal organization is something other than the declared organization" (Williams [1974] 2003, 93). This undoubtedly questions the agency that the broadcast exercises as a "cultural form" under the control of producers, which marks a particular phase of capitalist development and expansion of the consumer goods market in western countries. Television scholars have known about the concept of flow since its initial definition (Ellis 1982, 2000a; Fiske 1987; Hartley 1992; Gripsrud 1998; Grasso and Scaglioni 2003; Buonanno 2008; Barra 2015). This definition was put to the test by

transformations in the medium during the phase of multi-channel segmentation (Ellis 2000a; Lotz 2007, 2009; Scaglioni and Sfardini 2008) before being completely redefined by the current hybridisation of the television medium with the Internet (Uricchio 2004; 2009; 2010; Gripsrud 2010; Gillan 2011; Kackman et al. 2011; Strangelove 2015). In examining the transformation of the concept of flow, it is possible to trace the transition of television to its hybridisation with media environments arising from the development of ICT (information communication technology) and the Internet. At one end of the spectrum we can see television broadcast in its purest form in the United States, as analysed by Williams. This is a mainstream medium embedded almost uniformly in domestic and family lifestyle practices and human cognitive processes. At the other end of the spectrum we can see the current situation where the segmentation of content, the plurality of platforms, the ubiquity of (personal) screens and profound alteration of the temporal regime – no longer limited to the disciplinary power of broadcasters – have given rise to a strong divergence in how to access to the television medium and in related social practices. This seems to question the very nature of the medium, which becomes hardly recognisable in some consumer practices, especially generational ones that are being reinforced by the widespread use of multi-screening. In the middle of this continuum there is a long transitional phase whose various steps are still highly visible in the complex ecosystem of technologies and viewing practices known as "connected television" (Marinelli and Celata 2012).

The state of flux between innovations in technology, distribution methods, and consumption practices signals a "shift away from the programming-based notion of flow that Williams documented, to a viewer-centered notion" (Uricchio 2004, 239). The introduction of a device that we now consider trivial because of its very limited original functions, the remote control device (RCD), was significant. With the mere touch of a button the viewer mastered the function of control and choice, even if this was initially limited to channel change only. As the RCD became domesticated and used almost exclusively to change channels during commercial breaks, broadcasters became alarmed because this questioned the basic logic of commercial television, that is, the convergence of programme flow and economic flow. This is why Uricchio (2004, 243) correctly considered this innovation as to be "subversive technology", and its effects have continued to have a major impact on the viewing practices of contemporary television.

Following the advent of the RCD, it became almost impossible to make a distinction between the form of the viewer-television interface and the notion of flow. Each redefinition of both the technological environment and the user experience is reflected in a different configuration of the flow, which in any case involves ever-increasing audience participation. Somewhat paradoxically, even as the expression "couch potato" became more common, the introduction of the videocassette recorder

(VCR) dealt a second blow to the programme-driven temporality of the producer-controlled flow. This not only allows the audience to escape planned flow by changing channels, but it gradually re-defined viewing practices by favoring the choice of specific content, whether serial or singular. Consumers could now be segmented, also generationally, in accordance with their preferences and they became increasingly mobile and unpredictable. Time-shifting dismantles the isochronic logic and uniqueness of the experience. The criterion of repetition thus became a constitutive component of the flow.

New important changes also emerged as television entered the "age of plenty" (Ellis 2000a). New distribution systems (cable, satellite and video-on-demand) provided an unlimited number of TV channels, and the introduction of the pay-per-view business model transformed the characteristics of the medium, which became "an aggregator of a broad range of niche and on-demand viewing audiences" (Lotz 2007, 34). The general linear channels of free-to-air television, which continued to collect a significant portion of the audience, could not avoid "redoubling their efforts to maximize something like Williams's notion of flow in its most literal sense, linking program units in such a way as to maximize continued viewing" (Uricchio 2004, 247). As broadcasters began to follow the logic of multi-channel television, they had to adopt a strategy that relinquished their function as central agency, and invested in the viewers' autonomy. Narrowcasting proposes the aggregation of content planned by television producers in a "vertical" and highly segmented mode. A hundred channels were created and any topic could require its own specific televised flow (for example, not just one sport channel but a channel for each sporting activity, including horseback riding, fishing and billiards; not just live events but also time-shifting and/or re-runs). "In this new regime – the era of narrowcasting – not only was the once mass audience fragmented, but it gained a greater degree of agency in arranging its own programme sequence, in shaping its own patterns of interpenetration (zapping through advertisements, switching channels) and, thanks to the VCR, in defining its own course of programme repetition and recycling" (Uricchio 2010, 35).

The full development of narrowcasting gave way to a further redefinition of television flow that introduced many of the basic elements of the contemporary viewing experience. With the definitive entrance of television into the ecosystem of media and Internet-enabled communication (a consequence of the convergence process), television flow was no longer dependent on distribution channels. Access to on-demand content – through non-linear, IP-based systems – started to become a vital feature of viewing practices, regardless of the type of screen and specific context of use. A plurality of devices (laptops, tablets, smartphones, smart TV, set-top boxes) are available to individual users to build a highly personalised and contingent TV experience that is in constant transition between different screens (*place-shifting*), at home, on-the-go, or wherever they

may be. We have entered the era of anytime-anywhere TV where the television flow incorporates interactivity (as for all other IP-based technologies) as the driving principle of the viewing experience (Jensen 2008; Marinelli 2015). This is an era in which broadcasting linear channels are flanked, and progressively replaced, by a new form that Amanda Lotz (2007, 244) identifies with the expression "*personcasting*".

We can agree with Jensen's assertion that in contemporary television, "thanks to digital technology, interactivity, convergence, etc. now different forms of user-controlled content emerge", and that the viewing experience is deeply conditioned by "three prevailing forms of shifting: time shifting, space shifting, and format shifting" (Jensen 2008, 131). These technological innovations for distribution systems and screen devices give the user a greater power of control and more choices; the user is no longer "just a viewer" but is now increasingly skilled at handling multi-screening practices and multi-touch interfaces. However, this technological redefinition of television flow would be unable to express its full potential if it were not backed up by another form of audience leadership that was the product of the "convergence culture", as described by Jenkins in 2006. *User-generated flow* (Uricchio 2010), which redefines television viewer practices, corresponds with *user-generated content*, which refers to content appropriation, creation and sharing processes carried out by the audience on platforms for *online video aggregation* (such as *YouTube*), *peer-to-peer sharing*, and the practices of conversation and sharing of content, links, and recommendations that have played a role in the extraordinary rise of social media.

When every single television screen operates as a "network node", each user becomes a potential "node" that is increasingly active in the practice of remixing and sharing content and in all other social practices related to TV viewing; this is the so-called *social TV* (Andò 2014; Andò and Marinelli 2014; Barra and Scaglioni 2014; Colombo 2015). Thus, the extreme segmentation of tastes and consumption practices (*personcasting*), that characterises a large part of contemporary television, in no way implies a isolation of viewers and the end of the dimension of *shared cultural experience* that has always accompanied viewing. On the one hand, television producers have learned to promote and manage, along with viewers, an experience of flow that radically differs from the flow exemplified by the broadcasting powers. As Gillan (2011, 76) notes, "Today's flow is more circular, with one platform encouraging viewers to access another, which, hopefully, prompts them to return to the on-air-text". On the other hand, the transformation of television into a medium that requires audience engagement necessarily implies an appreciation of the discursive production that is independently generated by the audience, and an extension of the viewing experience on *second screen devices* and social network sites.

If "engagement describes the larger system of material, emotional, intellectual, social and psychological investments a viewer forms through

their interactions with the expanded television text" (Askwith 2007, 154), then the practices of social TV represent one of the basic elements of the *format-shifting* process that redefines the *circular television flow*. In the social TV experience, both inter-user and user-to-content relationships are at stake. On the one hand, social TV deals with the way that people stay in touch with each other and this includes all kinds of interaction generated by audiences with respect to the devices used (tablet, smartphone, laptop), inhabited in online environments (social media and apps), live/non-live interaction flows, before-during-after programme conversations, TV genres, and motivations for interactions (such as sharing, support for the programme, looking for rewards). On the other hand, social TV involves a digital relationship with the content, namely all the interaction – managed on second screens – aimed at gathering and sharing information about television content, and related to different programmes, celebrities (TV show hosts, actors), content, brands, and commercials (Andò and Marinelli 2014).

This circularity is therefore the new regime that characterises the evolution of television flow. On the one hand, it involves the practices that allow users to perform *personcasting* on the different screens available to them – these may be screens that alternate, overlap and recall each other in the flow configuration, depending on the time of day, the type of content, the device available at the moment, and their potential for connectivity and sharing. On the other hand, it involves practices that, on the basis of participatory cultures, consider media content not as a closed object but, rather, as an expressive form that extends to conversation, and the rewriting and sharing of practices that contribute to its circulation and constant redefinition through audience interpretation.

3. Circulation: The Life of Digital Content

The changes described above in terms of technological convergence and evolution of the user-interface, have actually released the audience from the constraints of space and time. The evolution of the concept of flow – from producer-controlled flow to user-generated flow – has the advantage of ultimately highlighting the changes that affect the relationships between viewers and content and, more specifically, the issue of audience agency with respect to digital circulation and the life of digital content, which we observe today in the most innovative consumer practices.

For this reason we have decided to expand the context of *user-generated flow* that characterises the contemporary viewer experience, especially for the younger generations (see Fig. 1 and the discussion about time-shifting practices), by hybridising it with the concept of circulation. Circulation is something more complex than the simple digitisation of media content and multiplication of access technologies and platforms. It

views media content as something unfinished – as an ongoing project, enabled by networking technologies and supported by audience participation that make its boundaries permeable with respect to space and time and its own materiality. "In other words we refer to the circulation in terms of digital life of a content that is definitely spreadable" (Jenkins et al. 2013, 4).

The concept of spreadability clearly refers to circulation. "Spreadability refers to the technical resources that make it easier to circulate some kinds of content than others, the economic structures that support or restrict circulation, the attributes of a media text that might appeal to a community's motivation for sharing material, and the social networks that link people through the exchange of meaningful bytes" (Jenkins et al. 2013, 4). However, we prefer the notion of circulation. Spreadability actually refers to structural elements of the content (and, to some extent, the logic of the medium) that benefit from – and require – audience participation ("if it doesn't spread, it's dead"). In this sense it overcomes the idea of transmission and virality, but it is not necessarily opposed to TV linearity and flow. Instead, the concept of circulation, as the effect of continued audience manipulation on the digital life of content, refers more effectively to a structural condition of the consumption experience, resulting in the consequent transformation of television flow.

It is therefore appropriate to take a step back and to rethink flow and its related concepts in the framework of circulation. For example, *time-shifting* and *place-shifting* are key concepts that, when applied to the idea of flow, underline the audience's freedom to choose when, what and where they want to view, regardless of the media and scheduling. These practices are clearly significant in justifying extending the framework boundaries, not only of traditional television but also of singular media, and in identifying the new producer-audience balance of power in the management of user-generated television flow. However, for scholars studying these phenomena, significance goes well beyond the tangible dimensions of content consumption, which (not coincidentally) continue to be calculated by market research that adapts various metrics systems to the multiplicity of screens and viewing slots. In fact, audience and media scholars regard these practices as the momentary expression of a wider circulation of content performed through audience practices in a *networked media space*, blurring the boundaries of traditional versus online social media.

The processes of "shifting" (*time*, *space*, *format*) (Jensen 2008) can be placed at the intersection between the interfaces of emerging media devices and *pervasive communications networks*, producing an ever-changing configuration of the viewing experience through *media technologies*. The way individual users come into contact with television content tends to resemble more and more the ways we use other digital things we come into contact with in our daily lives through online practices such as searching, linking, sharing, etc. The principal characteristic

of this new *networked media space*, which is made up of "flexible techno-social-spatial relations" (Chamberlain 2011, 15), is precisely its ever-changing and temporary nature; it is a space that needs to be constantly worked by the user and that takes on individualised and short-lived configurations.

We will try to define this networked media space where contemporary television viewing practices are performed, by presenting data collected by Osservatorio Social TV in Italy in spring 2015. We have selected the most significant data from the quantitative survey (CAWI) that was conducted with a sample of 1,082 Italians aged from 12 to 64[1]. The aim of the study was to analyse the transformation of TV consumption experiences in relation to increased technological availability, which means more screens to access TV content and multi-screening practices to expand the viewing experience on online platforms.

More specifically, the research addressed: 1) the definition of various TV consumption scenarios with respect to settings, technologies, content and level of engagement; 2) the mapping of several online practices of sharing, fandom and searching that definitely expand the consumption experience; and 3) the evidence of a TV content circulation that happens on different screens, on diverse online platforms, and by means of audience practices without limits of space and time.

For the purpose of this article we have selected data regarding audience practices that can demonstrate our theoretical reflections on circulation in the new media ecosystem with which we are faced. We used generations as interpretive category of such phenomena (Aroldi and Colombo 2003) to discover the audience that has a greater or lesser tendency to use the more innovative ways of consumption. Obviously, this means that the most innovative practices are more commonly used among the younger generation, especially with respect to regular behaviours ("usually"). However, in presenting the data we intentionally emphasise the "not usually" statistics because they can be considered as indicators of the awareness of TV transformation. These exploratory behaviours effectively represent the starting point in broadening the understanding of more advanced consumption practices.

3.1 Screens and Multi-screening

Even if not so evidently associated with the notion of circulation, in

[1] The CAWI survey was managed in two different tranches (May 2015) through SWG online platform, with a sample of 1,000 individuals (18–65 years) and 100 minors (12–17 years), segmented by gender, age, residential area, socio-economic conditions, educational level, and Internet connection. The questionnaire was made up of over 250 questions related to the availability of devices and use, consumption settings and scenarios, multi-screening, and social network sites use related to TV content .

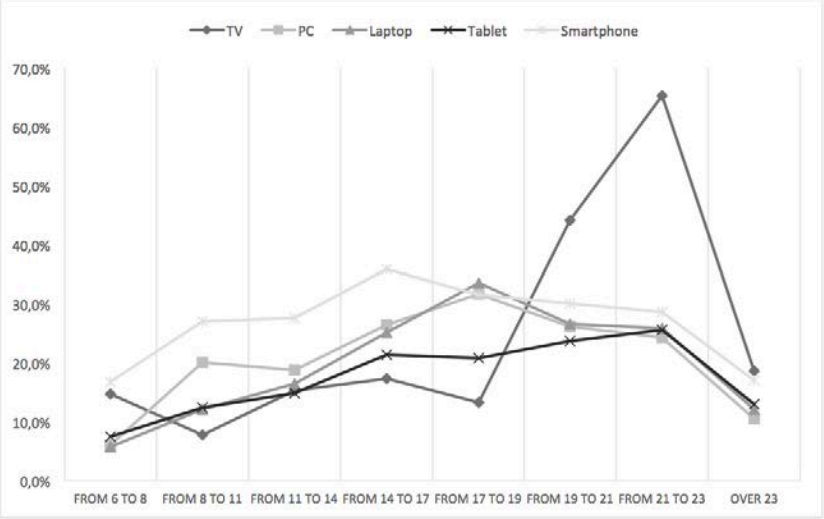
order to see what part of the audience engages in innovative forms of flow construction we first have to consider the use of different screens for watching TV (Tab. 1), the use of time-shifting and place-shifting practices, the user experience and motivations for multi-screening. As suggested by Uricchio (2004, 236), the transformations of television flow are actually a valuable indicator of the "coherence of generation, of clustered expectations, technological capacities, daily practices".

Tab. 1 – The use of different screens for watching TV content (only regular use).

	GenZ	Millennials	GenX	Baby boomers	Total
PC	20.0%	9.7%	8.5%	3.9%	9.4%
Laptop	28.2%	16.4%	6.9%	3.2%	11.8%
Tablet	20.6%	8.8%	5.0%	1.1%	7.4%
Smartphone	36.5%	13.9%	6.6%	3.2%	12.2%

Age Groups (yrs): GenZ (12-20); Millennials (21-34); GenX (35-49); Baby boomers (50-64). Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

Fig. 1 – TV, PC, Laptop, Tablet and Smartphone use by time of day.



Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

Laptops and Smartphones are the main alternative screens for *personcasting* and they are used by just under half of those surveyed. Users

under the age of 34 predictably exhibit the most innovative practices since they have rapidly become familiar with screen devices, using them in their daily activities (work/study/leisure time). The Smartphone is the preferred screen for users under the age of 20: more than 70% use it to watch TV content, with 36.5% stating that they use it for their usual viewing practices.

As for the temporality of consumption, the multiplication of screens is managed by the audience, who consciously and naturally do so during the day and progressively absorb time slots not previously destined for television.

Young people are exceptionally willing to circulate content across screens: more than a quarter of GenZ usually start watching TV content on a mobile screen and continue on a traditional TV screen; or they start to watch individually and then continue on a bigger screen sharing the experience with others.

Tab. 2 – Content circulation across screens (only regular users).

	GenZ	Millennials	Total
I begin to watch TV content on my mobile screen and then I share it with others on the TV screen	25.5%	19.8%	10.0%
I begin to watch TV content on my mobile screen and then I continue on the TV screen	27.7%	18.0%	10.0%
I watch TV content on the mobile screen while I move in different rooms of the house	40.9%	30.0%	15.6%

Age Groups (yrs): GenZ (12-20); Millennials (21-34). Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

Screen availability, along with access to time-shifting services, create a variety of consumption scenarios that take place during the day, providing a new definition of TV temporality that is actually based on audience needs. Due to greater complexity in managing work and other obligations, viewing pre-recorded content with PVR devices is used by the majority of people up to age 50, especially by the middle-aged group. As for the contexts of usage, where time-shifting and place-shifting overlap, we observe that watching TV on the web is also a viewing practice that is uniformly present across generations. "On demand" services promoted by broadcasters (Sky and Mediaset in Italy) is the usual viewing practice for almost 25% of teenagers but it decreases as age advances, in large part because current technological devices are not necessarily user-friendly.

Second-screening practices while watching TV on the main screen is

used, at least for the Smartphone, by a major component of the population (over 60%) and is split between regular and non-regular users. Around 20% fewer combine TV viewing practices with a laptop and/or tablet. The profile analysis shows significant generational differences: second screening involves a high proportion of people up to age 34 (80% on a Smartphone, and more than 50% on a laptop), whereas the mature and older generations are not far behind in these multi-screening practices, although their usage is, for the most part, "non-habitual".

Tab. 3 – Second screening while watching TV (only regular users).

	GenZ	Millennials	GenX	Baby boomers	Total
TV+Laptop	21.8%	25.5%	13.0%	6.3%	16.2%
TV+Tablet	25.3%	21.2%	13.8%	7.7%	16.1%
TV+Smartphone	49.4%	43.6%	18.3%	12.0%	28.5%

Age Groups (yrs): GenZ (12-20); Millennials (21-34); GenX (35-49); Baby boomers (50-64). Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

3.2 Multiple Touch Points with the Content

If we try to identify the reasons underlying the practices of time-shifting, place-shifting and multi-screening, we realise that these forms of access to television content, that no longer depend on the medium's logic, are the result of the availability of multiple touch points with the content. These can originate from producers and their engagement strategies, but increasingly come from the construction of meaning that is produced and shared by the audience.

In terms of the media content, this is related to the growing narrative complexity of television (Mittell 2015) and the emergence of media business models that are built for a world of participatory circulation. On the other hand, In terms of the audience, this is the result of audience engagement (Askwith 2007) with media content, of the environment of participation (Jenkins 1992), and of fandom practices that have become normalised in everyday consumption (Andò and Marinelli 2012; Booth 2015). Thus, circulation is "a mix of top-down and bottom-up forces [which] determine how material is shared across and among cultures in far more participatory (and messier) ways" (Jenkins et al. 2013, 1).

If, therefore, the heterotopia and heterochrony of digital content make the content itself constantly searchable, accessible, and consumable, the narrative complexity of contemporary media content further enhances their essence as objects without borders (i.e. fluid within the original media frame), and makes them endless (persistent in time and space), con-

tinually explorable, completable, spreadable, and shareable by the engaged audience. As Mittell (2015, 53) states with regard to serial forms:

> This account of narrative complexity suggests that a new paradigm of television storytelling has emerged over the past two decades, with a reconceptualization of the boundary between episodic and serial forms, a heightened degree of self-consciousness in storytelling mechanics, and demands for intensified viewer engagement focused on both diegetic pleasures and formal awareness. By exploring the formal structure of this mode of storytelling we can appreciate connections with broader concerns of media industries and technologies, creative techniques, and practices of everyday life, all of which resonate deeply with contemporary cultural transformations tied to the emergence of digital media and more interactive forms of communication and entertainment.

It is these formal structures of television storytelling – and their reworking by the audience – that serve daily as touch points between the audience (and among the audience) and the content, in a continuous process of circulation that takes place in a networked media space, vertically and horizontally, synchronously and diachronically.

To empirically understand the circulation process we can attempt to represent content digital life on a map by tracing the process activation (who) and its temporal dimensions (when). With respect to process activation, we can consider media content circulation to be the result of producer and distributor planning or audience activation. For the temporal dimensions we can look at the temporality of circulation by comparing official content release and the timing of audience consumption.

In the TV broadcast framework – as much in a regime of scarcity as in the age of plenty (Ellis 2000a) – content circulation was directly linked to its broadcast and essentially contained within it; in the connected digital TV circulation inevitably relies on distribution logic (such as the latest modalities introduced by Netflix) along with audience engagement in the process of content diffusion. In other words, along a continuum, at one end we find circulation that is fully managed from the top, which was typical of the broadcasting era. At the other end, we see circulation that is mostly managed by consumers, originating primarily from fandom experiences (Jenkins 1992; Bacon Smith 1992) and reflected in contemporary consumption strategies.

On the one hand, we have media content that begins circulating upon market release, that follows the schedule set by the broadcaster, and disappears at the end of transmission. On the other hand, we have media content that is either removed from the schedule or is unavailable on official distribution channels (such as international products that are inaccessible simultaneously in different markets), which begins to circulate among various channels (even illegal ones) because of fans' emotional investment or their influence on the production and distribution of the product.

Although it is currently difficult to isolate such widely varying modes of circulation, co-participation between producers and audience under the label of social TV (Andò and Marinelli 2014) appears to be prevalent. As stated earlier, within this definition there are very broad and diverse practices that are carried out by the audience and the producers, both of whom work on expanding television consumption beyond the boundaries of individual content through activities of commenting, sharing, searching and producing.

To better understand this step it is worth considering one of the simplest aspects of television content circulation: the launch phase of the product, which is ideally considered as the starting point of the circulation process. In the framework of broadcast television and television flow described by Williams, the television promo had the purpose of announcing the start of a new product in a specific time scale (the next few hours, the same day or, at most, the next few days) and a specific space (that of the TV network), essentially enabling the viewer to be pulled into a viewing experience from which it was difficult to escape, also due to these narrative junctions (Johnson 2013). Osservatorio's data confirm the relevance of TV promotions (74% considering usual and not usual behaviours), of zapping activity (91% considering usual and not usual behaviors) and of EPG (electronic programming guide) (84% considering usual and not usual behaviours).

Today, in addition to these more or less traditional communication formulae, there are others that depend on the social strategies of the broadcaster (see Tab. 4). In a context of strong competition for the attention of a niche audience, networks tend to personalise the relationship with the audience using quasi-informal channels of interaction through which new content is signalled in order to urge viewing, create engagement and participation, and strengthen audience loyalty.

Tab 4 – Social strategy of the broadcaster

	Usually	Not usually
I follow the Facebook account of the channel/network	13.4%	25.3%
I follow the Twitter account of the channel/network	10.2%	22.3%
I follow the Facebook account of the programme	12.4%	25.5%
I follow the Twitter account of the programme	10.6%	21.6%
I follow the Facebook account of the programme's anchorman/star	11.9%	22.8%
I follow the Twitter account of the programme's anchorman/star	10.4%	21.4%

Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

This continuous production of (supplemental) content related to (original) television content that is created by networks, programs, and presenters/stars, acts as a multiplier of visibility and access (see Tab. 5). The circulation of content can therefore be initiated by any of the different entities that produce the content, with their digital narration communicated through social media.

Tab 5 – TV content as expanded text in consumption experience

	GenZ	Millennials	GenX	Baby boomers
I watch only TV programmes (original format)	50.0%	56.1%	73.3%	83.5%
I watch both TV programmes and related contents (UGC on social media, mobi/webisodes, video extra)	44.1%	33.9%	18.3%	12.0%

Age Groups (yrs): GenZ (12-20); Millennials (21-34); GenX (35-49); Baby boomers (50-64). Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

As a matter of fact, content appropriation and constant engagement encourage the audience to take charge of the viral diffusion process, creating more potential touch points for the connected audiences (as exemplified in Facebook's algorithm that weighs the actual and potential audience – friends of friends – of a particular post).

Tab 6 – How to decide what to watch

	Usually	Not usually
I turn on the TV because of Whatsapp interactions about what's on the air	13.6%	25.8%
I turn on the TV because I am on social media and I am discussing something on air that intrigues me	13.6%	30.1%
I choose what to watch because of the information and/or suggestions on social media before airing	18.3%	40.7%

Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

However, what is even more interesting for the purposes of our discussion is the media circulation that begins with the audience as a result

of their interaction and online sharing practices. Falling into this type of behaviour are all those cases where audiences access media content on the basis of suggestions, recommendations, and live interactions. Considering both regular and not regular users, over 58% of the sample surveyed by Osservatorio Social TV decide what to watch on TV based on the information received from interactions on Facebook and/or Twitter, or decide to turn on the TV (44%) on the basis of online discussions accessed or participated in, or receive suggestions and/or recommendations via Whatsapp (40%).

3.3 The Expanded Digital Life of the TV content

In the cases described above, content circulation begins in a broader environment than one that defines the medium of television and its logic. Content comes to the attention of the audience through forms of hybridisation between the TV and the Internet, as in the case of television social media strategy, or from collective online sharing, as in the case of social networking sites or chat.

In this broad transmedia and connected environment, the expanded television texts that the audience interacts with offer other touch points with content that guarantee a more substantial consumption experience that enlarges the boundaries of simple viewing. Returning to the question of the narrative complexity of television content, today's media content offers the audience infinite points of access and opportunities for engagement that revolve mostly around the recreational aspect of consumption. In learning from fandom practices, from textual poaching to collecting and cosplaying (Fiske 1987; Jenkins 1992) that expand the borders of the cult content to a total appropriation of the product, media producers now know that they have to respond to the desires of the audience to build an intense relationship with the product. In search of a relationship that is defined by Meyrowitz (1985) as para-social, which guarantees media content a life far beyond viewing practices, they have created the option of following and/or interacting with the stars of the media content.

Tab 7 – Audience practices off screen.

	Usually	Not usually
Buying premium content related to the programme (music, dvds)	9.6%	20.2%
Online shopping of products shown in TV content or during commercials	9.8%	21.9%
Following the celebrity on Twitter, Facebook or Instagram	11.9%	21.8%

Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

As documented by Osservatorio Social TV, a third of audiences are engaged in following celebrities on social media and posting and sharing their images in order to satisfy a need to feel close to the content (Marwick 2011); they may even be interested in copying outfits (Andò 2015) or buying product brands seen on screen and using them as transitional objects (Hills 2002) or identity markers. In all these cases we find consumer behaviour that becomes a true replication of television content, which definitively goes beyond the screens and is reflected in everyday life, where it is used in interactions with others, thereby initiating further processes of circulation and sense-making. According to Osservatorio, these practices that take advantage of the potential use of a connected second screen, either during or after watching TV content, are seen in about 30% of the Italian sample (as both an habitual and non-habitual practice), mostly in the younger generations, but they potentially involve a further 15% of the subjects.

Tab. 8 – Why do you use TV companion apps?

	Usually	Not usually
It lets me to find information on TV programme/star	20.0%	28.0%
It lets me participate in the programme (voting, etc.)	20.9%	26.1%
It lets me to access exclusive content	17.3%	24.1%
It lets me keep in touch with the TV programme and its characters	15.1%	24.7%
It lets me play with the TV show and its characters	15.0%	20.1%
It lets me share my engagement with the TV program (i.e. check-in apps)	15.1%	19.7%
It lets me connect with brands mentioned during the show and its products	13.4%	19.3%
It lets me be part of the show with content generated by the user	14.5%	18.1%
It lets me get in touch with a programme/channel community	13.6%	17.8%

Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged 12 to 64 in May 2015.

The audience, therefore, appears committed to constantly keeping the bond alive with their object of interest, thus helping to extend its longevity and pervasiveness as well as its cultural centrality. In their nomadic approach to the connected media-scape, the most active audiences experience whatever media form is able to expand or amplify content consump-

tion. The digital life of content expands along a greater spectrum that crosses the same time and space while taking on another form of the content and thereby representing an extension, a reference, a continuation. The programme's music becomes a further segment of the original media content that can be claimed and which keeps the content alive; the purchase of the DVD becomes a collecting strategy to replicate the viewing experience whenever you want.

At the same time, the downloading of applications built for the second screen allows the audience to expand the recreational content space using innovative means that are unavailable in the original content and are experienced in transmedia forms, as seen in our research data. Apps enable users to discover additional information about programmes and characters (48% of the sample), and to play with (35%) and participate in (47%) the programme. They encourage audiences to follow the stars even after the programme has aired (40%), maintaining an ongoing relationship with the familiar faces of the stars and providing access to exclusive content (41%) that represents a transmedia expansion of the original content.

In a way, this group of practices represents an extension of the content itself and its re-actualisation in audience consumption experiences. This practices and media forms clearly indicate the rigidity of theoretical reflections that focus on an individual device and its original technological form.

Tab. 9 – UGC (user generated content) creation and sharing (while watching TV).

	Usually	Not usually
Share on social media a video from the web/online newspaper	18.7%	31.2%
Share on social media a video from YouTube/Vimeo	19.7%	32.3%
Share a video posted by others on social media	15.8%	32.1%
Make a video of TV content and then share it on social media	10.4%	22.0%
Take a picture of the TV screen and then share it on social media	13.9%	34.2%
Make a live video of the TV screen and then share it on social media	11.4%	28.2%

Source: Osservatorio Social TV 2015 – CAWI – 1,082 Italians aged from 12 to 64 in May 2015.

This is an important point for understanding the production of user-generated content that is related to specific products and their circulation

on the web. The screen shot of a programme broadcast on a television screen or any other device is not the programme itself, even if it contributes to the circulation of the original content. In the same way, videos, photographs, and drawings that the audience use to produce their own revised version of the original content act as a reinforcement of – or a touch point to – a specific content and determine its long tail in the market (Anderson 2006; Napoli 2010). We are speaking of practices that, taking account of both habitual and sporadic consumption, are not so uncommon, especially among the younger generations (their statistics are 7 to 10 percentage points higher than the total audience average).

These are no longer exclusively fandom or niche practices whose purpose was primarily to strengthen the relationship with the object of worship among the fans within the framework of a closed community, but they are becoming normalised daily activities that nourish the social life of the audience and make the media content pervasive and timeless.

The question of viewing times leads us back, then, to our map and the management of content circulation time with respect to the needs of producers or consumers. This is the battlefield where producers and audiences are constantly engaged, which the latter are still unable to dominate. Or at least this is true as far as regards the first release of a product on the market. Even when we look at the most innovative OTT (Over the Top Television: see Wolk 2015) strategies (as in the case of Netflix) (Braun 2013), which make a serial product available to its subscribers in its entirety, ultimately dismantling the logic of the schedule (Ellis 2000b), we should keep in mind that the timing of the release is still set from the top and that in these cases the *liveness*, understood as content (and imagery) that is available to all the audience, remains a constitutive and defining aspect of the television experience. However, it is equally clear that the degree of audience freedom in the creation of new user-generated consumption practices is still greater than it is in traditional television flow, even when based on market strategies that try to anticipate audience viewing behaviours. In on-demand television systems, therefore, it is worth referring to De Certeau's idea of trajectory: the audience can act in environments defined by strategies using tactics (De Certeau 1984) and adjusting and modeling the temporal dimension of consumption, although this happens anyway in the framework imposed from above.

Another issue is the length of time and the unpredictable circulation of digital content following the release of media products on the market. We refer here to the circulation that can arise from the spread of user-generated content related to media content, or the use of cross-media outlets such as YouTube (Uricchio 2009). As evidenced by the most recent reflections of fandom online (Booth 2015), previously unknown content can be discovered on a video seen on YouTube, in an article in a blog, in a discussion online, and by the sharing of images, animated gifs and memes. This can happen thanks to suggestions and recommendations that are typical of peer culture, which is the basis of the idea of collective

intelligence, set forth by Jenkins (2006) regarding the affirmation of the Web 2.0. Once the touch point with the content is activated, the audience can appropriate it, freeing it from the logic of the medium, as seen in the phenomenon of binge watching (Jenner 2016) or post-object fandom (Williams 2015). The first phenomenon is useful in understanding how the time of consumption can be placed directly in the hands of the viewer, and even condensed to the maximum. A significant example of this is the experiment by fans of "24" (Imagine Entertainment, 20th Century Fox Television) who watch an entire season in 24 hours to adapt to the temporality of the story (Mittell 2006). The second phenomenon is extremely relevant with respect to the persistence of content over time and its infinite circulation: the online presence of fandom communities encourages their emotional bonds through media content beyond the time of cancellation, through user-generated content shared with other enthusiasts. This is indicative of the effects of audience participation in the content circulation process.

4. Conclusion

The evolution of the concept of flow from producer-controlled to user-controlled to circulation, as discussed, describes a trajectory that leads to the deconstruction and subsequent reformulation of the concepts of space, time, and medium.

The space is deconstructed in two senses. First, it is broken down through the use of different screens in which the flow is constructed/generated/exchanged and the specific use of contexts that govern or induce the choice of technology. Second, it is deconstructed by extending the conversations and social contacts that begin during consumption and which form a major part of the networked media space.

Data from Osservatorio Social TV confirm that place-shifting practices are widespread, especially among the younger generations (GenZ, Millennials), and TV content circulates on different screens during the day, accompanying other activities such as studying, working or relaxing. At the same time, multi-screening practices, mostly using a smartphone, provide real time access to the networked media space where it is possible to find information and to start social interactions.

Time loses its original constraints and is restructured on the basis of a continuous negotiation. The circulation of content is nurtured and revived by the producer in expanded ways across multiple platforms and modes of release of digital content; audiences selectively choose the content produced in their own personal flow, assigning it a time and, therefore, a digital life.

Even with respect to temporality, the viewing practices identified by Osservatorio demonstrate the audience's ability to enhance the specific heterochrony of digital content that is distributed through multiple plat-

forms, constantly searchable, accessible on demand, and consumable at the right time by users.

Finally, with respect to the medium, the evolution from the concept of flow to that of circulation inevitably blurs the well-established boundaries between technological and cultural forms, leading to their hybridisation with the formats of interpersonal conversation in online environments. In the networked media space, the domains of communication are definitively mixed through "techno-social-spatial relations" (Chamberlain 2011) that can be established through the audience's active contributions and participation.

As demonstrated by research data on TV content circulation within online environments, social media act as an inter-change platform where needs, desires, and pleasures of the audience converge. This results in the perception of an endless experience of TV consumption and the simultaneous extension and independence of content life-time from those boundaries imposed by producers and broadcasters.

It is evident that the crumbling of technological and space-time barriers represents a condition that encourages and supports the extreme selectivity of the user in flow construction. Likewise, the visibility and traceability of consumer behaviour and interactions online provide a wealth of knowledge (Big data) that establishes new forms of potential audience discipline.

As for television, the ancient wisdom exercised by broadcasters in the construction of linear schedules will probably be replaced by the wisdom in Big data management by new-generation television operators (OTT services such as Netflix). What appears to the users' free expression of their selectivity in the construction of personal flow within the circulation framework, will remain as a form of mediation between the careful planning of the flow from producers/distributors/market researchers and the consumption practices carried out by the audience in the complexity of the pre-selected media content.

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Circulation of Technology, Circulation of Desire

Cybersex and the "Sadian Collective Intellectual"

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Abstract: Cybersex represents a particular, distinctive form of sexuality. Computer mediation enables the *hic et nunc* to be suspended thanks to processes such as deindividuation, self-disclosure and visual anonymity. These characteristics allow individuals to develop fantasies that recall the worlds explored by Sade's universes in much the same way, i.e. through narrative practices. The article addresses these questions by presenting data coming from an ethnographic empirical research based on online sexual activities. Borrowing from the works of Akim Bay and Pierre Levy, the article introduces the concept of "Sadian collective intellectual" in order to interpret the evolution of extreme sexual interactions over the Internet. On the basis of this empirical data, the article argues that the use of technological platforms such as chat rooms amplifies the circulation of extreme sexual imaginaries and leads to the formation of micro-communities around them. Internet also enables the construction and circulation of symbolic material to be used in exploring and activating "extreme" desire. By means of this circulation, the boundaries between real and virtual are reshaped by those who define themselves as "amoral", "perverted", "evil", the protagonists of narrations of rape, incest and violence. As in the relationship between Sade and the objects of his compositions, desire and pleasure can only exist in the absence of the other party.

Keywords: cybersex; chat rooms; Sade; collective intellectual; temporary libertine zones.

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> Yes, I am a libertine, that I admit. I have conceived everything that can be conceived in that area, but I have certainly not practiced everything I have conceived and certainly never shall. I am a libertine, but I am neither a criminal nor a murderer.
>
> *Marquis De Sade, Letter to his wife, February 20, 1791*

> I write some stories in this group, and I do not go out and rape, torture or murder people in real life. I write about women getting raped, but I would never rape a woman, I AM a woman…
>
> *ShadowMist, alt.sex.stories posting, May 18, 1995*

1. Online Sexual Activities and Digital Media Circulation

Online sexual activities (OSA; Shaughnessy et al. 2011; Byers and Shaughnessy 2014) have seen a rapid growth and a capillary diffusion in the last two decades, thanks to the technological innovations that have shaped and changed their uses. Over time, various different means have emerged in succession, from the bulletin board systems (BBS) and newsgroups of the 1990s to the social networks and role-playing games since the turn of this century. The passage from one communication environment to another has engendered important novelties, making the asynchronous written texts used by the BBS evolve into the synchronous video images of chat services that rely on the use of webcams and microphones. The individual and collective consequences of such changes have attracted the attention of researchers, particularly as regards the most widespread forms of OSA, pornography and cybersex, which have been the object of a sizable body of studies in the last 15 years (Griffin-Shelley 2003; Döring 2009; Short et al. 2012; Stern and Handel 2001; Owens et al. 2012; Manning 2006).

Our interest in these technological developments focuses not on their psychological fallout or the social alarm they have aroused (on these issues, see Cooper et al. 2000; Schneider 2000; Young 2008 for instance), but on the ways in which production processes, sexual content, and modes of use have circulated from one communication setting to another. We hypothesize that, if we analyze these passages, we will find a core set of characteristics that remain constant, albeit adapted to the specific features of each medium, old or new.

We shall consider a particular type of cybersex that involves the collective production of stories of "extreme" sex, developed mainly in chat rooms, Multi-User Virtual Environments (MUVEs) such as *Second Life*, or Massively Multiplayer Online Role-Playing Games (MMORPGs) like *Sociolotron*. The stories refer to actions and situations that are "extreme" not just because they are unusual (bondage, dominance and sadomasochism [BDSM], fetishism, transgenderism), but also and primarily because they go beyond the boundaries of what is considered ethically and socially acceptable (rape, kidnapping, snuff). The radical obscenity of the

stories being told is such that it is otherwise only expressed in written form, fictional movies or cartoons – and some of their violent features can be seen in "real TV" or hard rock too, as Attwood (2014) pointed out.

Even restricting the field in this way, the extreme texts to which we refer focus exclusively on sexual settings and episodes intended for the purpose of sexual arousal. They may contain descriptions of events and circumstances on a level of intensity almost unknown to other communication media. If the writers are normal individuals describing their most secret and violent fantasies (as happens with the web 2.0), the impact is often even stronger than could be achieved by horror or splatter films. Chat services, blogs, MUVEs, and so on also sometimes enable roles to be interpreted in the first person, thus transforming the story into a genuine performance in which participants become protagonists.

We shall see that, even when the help of avatars is enlisted (as in *Second Life*), the verbal exchange remains the fundamental, essential means for moving within these worlds (Waskul and Martin 2010). The written text is consequently the only tool that enables someone to venture into scandalous, excessive scenarios that would be impossible to reproduce in any other way. This is the prerequisite that makes extreme erotic stories irreplaceable in certain niche markets, even now that the market has been saturated with photographs and videos showing every aspect of sex that can possibly be depicted or imagined.

The history of obscene writings goes back a long way (Hunt 1993; Darnton 1996), but the prototype that possibly summarizes and symbolizes its content and its destiny over centuries of censorship is the work of the Marquis De Sade. The constant core features of the material circulating between the various media whenever such "extreme" situations are described that they verge on the limits of representability can all be found in Sade's models, and not only inasmuch as concerns their orgiastic content and excesses. Certain rhetorical tools must be used in order to speak about the "unspeakable", tools devised for printed books that the web subsequently simplified and made accessible to anyone.

It is surprising to see just how closely the content of BBS and newsgroups resemble the topics described by Sade, although there is no mention of these latter-day authors having wittingly followed his example, or even read his works. It is also surprising to find that BBS, newsgroups, chat services and MUVEs reproduce the same conditions of segregation and isolation in which Sade places his libertine characters. So, based on these similarities, the idea that a "Sadian collective intellectual" exists all across the web and the various modern communication media is not intended as a metaphor, but alludes to the fact that, in order to speak publicly and collectively of certain topics, there are preliminary conditions to be met that have remained unchanged since Sade's time.

The term "Sadian collective intellectual", introduced here for the first time, is inspired by Lévy's concept of *intellectuel collectif* (1994) – translated into English in 1999 as *collective intellect*: something that "pro-

motes the construction of intelligent communities in which our social and cognitive potential can be mutually developed and enhanced" (Levy 1999, 17). Leaving aside the utopian approach that animated Lévy's interpretation, the concept is nonetheless useful for describing the process of participation by means of which several thousand people have contributed collectively over time to spreading a body of narrative content resembling Sade's models using various digital platforms.

The aim of the article is to show that the set of narrative artifices invented by Sade in his novels (such as isolation, secrecy, unrealistic imagery, disinhibition) remained somewhat constant in new media sexual interaction and have recirculate from the printed media to latter incarnations in digital world. To do this, we begin by identifying the original features of Sade's work that came to be reiterated in the various passages from one technological medium to another. Then we take a look at the developments of platforms for extreme sexual activities (from the BBS to *Second Life*) and how this evolution contributed to the circulation of sexually "extreme" messages and content. We then present an empirical study on the uses made today of chat rooms in the IRC network where Sade-style conversations are still being held without the support of the latest technologies. Finally, in conclusion we discuss both platforms' evolution and ethnographic original data in order to address the process of circulation of extreme sexual representations across different media technologies and platforms along the time.

2. The Structure of the Sadian Text

To understand how the "Sadian collective intellectual" takes shape in the various stages of Internet's evolution, we need to see which elements of Sade's works have subsequently circulated - virtually unchanged - in the "extreme" stories told on the web by means of the various platforms available. As mentioned earlier, this is a question of identifying a homology not of content, but of production processes and modes of consumption.

There are two main characteristics of Sade's writings that we should consider.

1. The first concerns the enormous lack of realism in the situations he describes: the story he tells is deliberately *excessive*, not only because the content is extreme (orgies, crimes, abductions), but also because of the obvious lack of realism in its staging. Sade's novels do not aim to be "realistic", because comparing his portrayals with the real world would defeat the main object for which they were written (and for which they are often still read today), which was to arouse the reader's sexual imagination with infinitely exaggerated, and consequently "excessive" scenarios, wholly out of proportion with reality. The separation between the story and real life goes so far as to make the scenes of "extreme sex" essentially absurd and

abstract, since most of them would be logically and physically impossible to put into practice. "(…) if some group conceived the desire to realize literally one of the orgies Sade describes (…) the scene would quickly be seen to be utterly unreal (…) all surpass human nature" (Barthes 1989, 136). What drives Sade's narrative is the imagination, with its own particular "language".

2. The second characteristic lies in the need to provide a secret, separate place where Sade's heroes can create their own, entirely artificial world, untouched by the laws and constraints governing ordinary daily life. This element originates from a narrative pretext that is a constant feature of Sade's novels, the prototype of which is the castle in Silling where the libertines take refuge "hermetically isolated from the world by a series of obstacles" (id.), in *The 120 Days of Sodom*; this is the model for every other *locus clausus* where the adventures of Sade's characters take place. Their isolation is necessary for reasons of security (to avoid being discovered, unmasked, and persecuted) and also to create a symbolic environment where scenarios and fantasies unrestrained by any moral, social or legal limitations can be imagine and enacted. The reign of the libertines must be one of unquestioned, self-sufficient dominion, where everything conceivable is allowed, approved and practicable.

These conditions are reiterated in instances of social segregation known and analyzed long before the birth of the web. In the words of Goffman (1990, 102): "Finally, there are back places, where persons of the individual's kind stand exposed and find they need not try to conceal their stigma, nor be overly concerned with cooperatively trying to disattend it". The separation that generates half-hidden communities, where individuals who share certain characteristics seek each other out and come together, is not only a literary invention. Goffman foresees the modern proliferation of digital "back places" provided for the benefit not only of individuals who are stigmatized, but also of stigmatizing individuals interacting with one another, who find a safe place where they can nurture their extreme erotic fantasies. What Sade's castle and Goffman's back places have in common is their function: both provide an "other world" where people can withdraw, a place where the rules governing normal daily life are suspended and cast aside, and "abnormal" behavior and actions are acceptable.

The way in which these separate spaces can be imagined and managed in the web has been theorized by Hakim Bey (1985) through the concept of *temporary autonomous zones*. The idea of such zones as a virtual territory where there is no hierarchy, no social control, that is essentially a figment of the imagination of a group of individuals and destined to a brief and intense existence, is in itself rather extreme and might seem far removed from Sade's proposals and Goffman's descriptive goals. But on closer inspection, it appears to complete Sade's isolationism by adding the provisional and precarious traits of the rooms that can be opened and closed in chat services or meeting places in *Second Life*. This is a concept

well suited to the object of our analysis - so much so that we might, with some license and approximation, describe the Sadian back places of the web as *temporary libertine zones*, where it is allowable to imagine actions and situations that would be impossible in any other setting involving the mutual exchange of messages.

These *Temporary libertine zones* serve as containers for known effects (already described in the literature) because they create the conditions of anonymity, secrecy, and release from the rules of daily life that define their autonomy. An opportunity for *self-disclosure* (Qian and Scott 2007) and *visual anonymity* (Joinson 2001) thus triggers the deployment of various *online disinhibition effects* (Suler 2004), which lay the subjective foundations for these virtual back spaces to become established, ignoring taboos and social norms: "Due to its mediated nature and the opportunities it offers for anonymity, cybersex helps to lower inhibitions and also encourages particularly open communication. Sexual inclinations and preferences otherwise concealed in the real world due to the fear of rejection can be acted out on the Internet" (Döring 2009, 1095).

Having thus delineated the field of our analysis, we can proceed with a detailed description of the steps that lead to the creation of *temporary libertine zones* along the lines of Sade's writings, but in the setting of the new media. Beginning with the newsgroups, we then going on to look at the MUVEs, and conclude with an empirical analysis of the usage of the old chat services, that some users have yet to abandon in favor of the social networks or WhatsApp.

3. Step One: From Elite Literary Writings to Anyone's Writings

The asynchronous computer-mediated communication born with the BBS was used for sexual purposes (Wysocki 1998) right from the start, but it was with the rise of Usenet that various newsgroups formed and were organized by topic, leading to a specialization and rationalization of their content. Among the latter, one of the most popular in the 1990s was *alt.sex* (*alternative sex*), a discussion group on sexual topics that included various subgroups (alt.sex.pictures, alt.sex.stories, alt.sex.blondes, alt.sex.bondage, and so on).

The *alt.sex.stories* newsgroup was officially established in 1992 for the purpose of collecting "stories" of sexual content written mainly by non-professionals: common people who put their own fantasies into writing. The idea was an instant success, also thanks to the extreme freedom of speech granted to the various authors.

Sproull and Faraj (1997) reported that *alt.sex stories* had 120,000 readers in 1993, and a volume of 338 messages exchanged every day. Most of the content, however, was not concerned with representing con-

sensual and conventional sexual intercourse. As Jekyll (2006) put it: "Stories include romances, sexual interludes, and loving, marital sex, but they also include homosexuality, adultery, and such hot-button themes such as sodomy, incest, kidnapping, rape, bondage, domination and submission, sadomasochism, torture, scat (feces), watersports (urine), mind-control, bestiality, pedophilia, mutilation, and snuff sometimes in complex combinations".

As of April 1993, all stories are attributed codes (see Table 1), in the form of acronyms, so that potential readers are aware of what type of sexual situations a story describes. This innovation has also made it easier to produce quantitative analyses on the newsgroup's content and obtain a picture of the distribution of the various topics.

Table 1 – List of codes used by alt.sex.stories to classify the non-conventional and non-consensual content in the various posts.

Abbreviation	Description
b, g	Boy - Preteen (age 12 or younger), Girl - Preteen (age 12 or younger)
best	Bestiality. Sex with an animal (see also zoo)
blackmail	Forcing sex through threat of exposure
h	A hermaphrodite under 18
inc	Incest
m, f	Boy - Teenager (13 - 17), Girl - Teenager (13 - 17)
mc	Mind control
nc	Non-consensual Sexual Activity
nec	Necrophilia: Sex with a dead person
ped	Pedophilia: Some participants age 12 or below
rape	Brutal non-consensual intercourse
reluc	Starts out as rape, but she loves it.
snuff	Killing for sexual pleasure
tort	Torture Severe non-consensual infliction of pain
va	Verbal abuse. Abusive and dirty language
viol	Violent, not always sad
vore	Eating (literally) someone or something alive
zoo	Zoophilia: Caring and consensual sexual relationship between a human and an animal

As we can see from Table 1, the inventory of paraphilias described by the codes includes the whole repertoire inaugurated by Sade in his 120 Days of Sodom.

In 1997 Harmon and Boeringer examined a sample of 196 stories and found that 40% of them involved non-consensual relationships. Barron and Kimmel (2000) subsequently studied the levels of violence being represented, showing that alt.sex.stories contains quantitatively more violence and places a qualitatively greater emphasis on violence than the pornographic magazines and videos sold by porn shops. So the realism of the visual image is not enough to supersede the evocative power and impact on the imagination of the written word. Proceeding with our own investigation, we grouped the 2,661 files in the historical archives of *alt.sex.stories* (http://www.asstr.org/) according to how the authors describing the various activities involved in the stories had classified their content (see figure 1). We thus obtained the data shown in Table 2, where a distinction is drawn between "non-conventional" and "non-consensual" sex. The former includes sexual activities that are bizarre, unusual or inspired by paraphilia, undertaken on the grounds of an agreement between the parties involved. The latter refers to all forms of sexual activity undertaken without the consent, or against the will of one of the parties concerned, which thus implies some direct or indirect form of violence.

Title	Author	Category	Length	Rank
1,000 Kisses	Marlissa	Slave/Master	Medium	940
2 Time Story	Alun	Consensual Sex	Short	850
3 Dogs	Unknown Author	Animal	Short	300
90210 (Chapter 1 Excerpt)	Watkins, Michael	Television Parodies	Short	900
A Baby Pants Prisoner	Unknown Author	Humiliation	Short	100
A Better Insurance Policy	POC	Slave/Master	Medium	700
A Big One For Mom	Mr. Strawberry	Incest: Son/Mom	Short	800
A Big Tit Breast-Play	Unknown Author	Breast Fetish	Short	500
A Blackmailed Wife	The Editor	Slave/Master	ling	700

Fig. 1 – 2.661 files in the historical archives of *alt.sex.stories* (http://www.asstr.org/) according to how the authors describing the various activities involved in the stories classified their content.

The proportions of non-consensual, non-conventional and other stories (including those reported as be consensual – see Table 2 on the next page – are roughly the same, with one third each, so the interest of authors and readers taking part in the newsgroup clearly focuses on forms of non-ordinary sexuality, with the non-consensual and violent stories taking the lion's share (62.2%).

Table 2 – Non-conventional and non-consensual stories.

Category[1]	Non-conventional		Non-consensual	
	N.	%	N.	%
Animal			80	3.0
Bondage	60	2.3		
Breast fetish	14	0.5		
Female domination	25	0.9		
Homosexual/Lesbian	108	4.1		
Humiliation			34	1.3
Incest/Kids/Family			393	14.8
Medical exam	9	0.3		
Other incest	42	1.6		
Mind control			103	3.9
Pregnancy	29	1.1		
Rape			159	6.0
Slave/Master	246	9.2		
Slut wife	37	1.4		
Spanking/Whipping	120	4.5		
Torture/Death			68	2.6
Transgender	53	2.0		
Voyeur/Watching			42	1.6
Weird/Unusual	32	1.2		
Totals	775	29.1	879	33.2
Total Non-conventional + Non-consensual	1654	62.2		
Consensual sex	403	15.1		
Other*	604	22.7		
	2661	100.0		

Source: alt.sex.stories depository, Story list sorted by title, 05/30/98.

Leaving aside the content, the Sadian characteristics on which we focus our interest concern the processes by means of which this content is produced and circulated. In *alt.sex.stories*, the structure adopted for a considerable number of the stories is the same as in Sade's novels. The newsgroup provides an isolated, secure digital environment. In order to join, you need to be familiar with the computer procedures needed to access the site, and you need to be sufficiently "libertine" to enjoy reading or posting stories. After joining the newsgroup, people have the opportunity to conceive of convincing, but wholly unrealistic situations, placing no limitations on their imagination and disregarding any ethical or practical constraints. The web allows them to fully and collectively enjoy the

[1] Codes with at least 5 cases: Action/Adventure, Comics, Erotic Horror, Fantasy, Halloween, Humor, Ideas, Interracial, Masturbation, Non-sexual, Religion, Romance, Science Fiction, Unknown.

disinhibiting experience that was once a privilege of Sade's characters.

It is therefore hardly surprising that, at the start of the 1990s – when forms of visual pornography (in magazines and video cassettes) were already abundantly available – computer-mediated communication provided material in the form of a story that the porn industry was unable to "show" (Torture/Death, Rape, Incest/Kids/Family). Horror and pulp films come closer to this type of content, but often in a rough and ready fictional form that lacks the capacity to involve the viewer emotionally and the evocative effect of written words. The underground market for photographs and videos boasting "real" scenes of violence or pedophilia remains prisoner of a brutal realism that is unable to stimulate the viewer's imagination, violating aesthetic as well as ethical and legal norms, and destroying any opportunity for storytelling (Plummer 1995).

The opening of *Temporary Libertine Zones* enables people not only to voice their most extreme fantasies, but also to act as both author and consumer, become fused in the figure of the *prosumer*. The newsgroup allows for comments on the stories posted, thus giving users a concrete chance to develop a "collective intellectual" that enables the circulation of styles of representation, sexual scripts (Gagnon and Simon 1973) and erotic scenarios of Sadian type.

4. Step Two: From Stories to Narratives Acted out in Chat Rooms Interactions

Chat sites began to operate in the same years when *alt.sex.stories* was proving successful. Though still relatively primitive forms of communication, they were equipped with what the BBS and newsgroups lacked, and that is the synchronicity of the messages being exchanged. Users could now "speak" to each other as if they were on the phone, taking turns as in a normal conversation. This is when the first research on the new phenomenon of Internet used for sexual purposes was conducted. We shall return to this more extensively in the last part of this paper, when we describe the study that we conducted in 2014 on several Internet Relay Chat (IRC) platforms still in activity.

Here we introduce the topic to speak about the resources that synchronous exchanges make possible. Lamb (1998, 131), for instance, discovered that people taking part in a chat under a false identity can be divided into "those who told tales theoretically of their own experience and those who related fantasized sexual experiences with my persona". Some of those interested in sexual experiences with minors were particularly expert in the biographies of child-actors, who they offer to impersonate in their exchanges of messages with other users. This marks a departure from the inheritance of Sade's novels (which still persisted in *alt.sex.stories*) and a move towards an original elaboration of fantasies

that describe real people (the child-actors), or develop into role-playing games during the course of which the participant "acts out" the child's part.

The unreal dimension emerges here, as in Sade, because the toy children constructed in the interaction are attributed sexual capabilities or physical attributes that they could not really have: "In the final conversation, the individual began talking like an adult". This leads to a two-fold fantasticated simulation: participants pretend to be well-known actors, and also attribute inappropriate characteristics to the pretend subject they impersonate, along with a general "lack of knowledge and detail of contemporary teen life: school, clothing, music and vocabulary". In other words, the representation of the roles is naive, conforming to a mechanism typical of pornography since it concerns not a real individual, but a "simulacrum" (Baudrillard 1994) generated by means of the exchange. As in Sade, this reflects the all-powerful role that the authors wish to have over their victims, but in this case they do not *describe*, they *impersonate*, disregarding all biological and social constraints, in a domain where their imagination reigns uncontrolled.

This change identifies a radicalization of the chat users' role: they are no longer restricted to "reading", but are almost bound to be asked to take an active part in producing the erotic scene, in which they become protagonists. The *Temporary Libertine Zone* generated in the chat thus serves as a place for the collective creation of increasingly realistic stories, especially from the point of view of the *prosumer* involved in the production process. Readers of Sade could not possibly have such a role, nor could readers of *alt.sex.stories*, even allowing for the fact that the latter can post messages.

This completes the developmental cycle of the Sadian imagery circulated by means of computers. In conditions of social segregation, in the back places made possible by chat sites, individuals can meet and communicate with one another for the purpose of establishing a place for expressing their most hidden desires, totally detached from the social rules of daily life, a place where they can treat the bodies of their victims in ways that only Sade could describe. A new type of realism comes to the fore: instead of telling stories, this is theatre; participants become involved in the first person, they "act as Sade", instead of quoting or reading him. The narration is ultimately replaced by the performance.

This changes the meanings and the erotic usage of chat sites and is alarming some observers, who have predicted the birth of new "pathological communities", triggering much debate among the experts (Quinn e Forsyth 2005; Durkin et al. 2006; Schwartz e Southern 2000). Some emblematic events had already hinted at this evolution[2], but had prompted

[2] For instance "in 1995, Jake Baker, a University of Michigan student, was arrested and prosecuted for a story on Usenet about kidnapping, raping, and

discussions mainly of a political and legal order, relating to the limitation of freedom of speech (Bilstad 1996; Faucette 1995).

The styles used to construct the dialogue in chat sites necessarily differ from the stories on *alt.sex.stories*, because they demand the use of short sentences being exchanged in the context of a conversation. Some Sadian characteristics nonetheless remain the same, while others are perfected. In *The 120 Days of Sodom*, the four libertine protagonists pay four female storytellers to "inflame" their senses with obscene stories. Aroused by what happens in the stories, the four men then try to take the same sort of action on their own victims. In chat rooms, modern-day libertines have a similar experience by "enacting" their own fantasies by means of an imaginary interaction with another user who accepts the rules of their game. This begins with the idea of impersonating someone or "constructing" someone as a designated victim of their own desire in a scenario in which they are actors, authors and stage directors at one and the same time.

5. Step Three: From Written Words to Avatars

The third step in the circulation of the elements comprising the narration/construction of extreme fantasies in digital environments has to do with virtual worlds where a person can move with the aid of an avatar. These graphic representations of the visitor may have the appearance of human beings or of imaginary creatures. They "visually" stand in for the individual controlling them. Using their avatars, people can take action on themselves or on others, and remarkably convincingly with the current levels of development of the technology. In dedicated digital environments, avatars can perform an extraordinary number of actions, like going shopping, visiting places, holding a meeting, going to university, even getting married, and much more, including flirting and having all kinds of sexual intercourse.

On the topic of *Second Life*, Waskul and Martin (2010) wrote: "straight sex, gay sex, trans sex, incest, orgies, masturbation, furries, sex toys, consensual rape, BDSM, sexual torture, bestiality, water sports, exotic dancing, prostitution, nudism. Any and all possible forms of sexual activity, some of which—not unlike Sade's *120 Days of Sodom*—are fantastically beyond the realm of what can be done in the flesh" (pp. 299-300). We are not very far removed from the sexual activities described in the *alt.sex.stories* codes, and Sade seems to have an important role in Second Life too: the success of the erotic games played by its *Residents* was so great that the founder, Linden Labs, decided in 2009 to develop an is-

murdering a woman with the same name as a UM classmate. The prosecution was ultimately dismissed by a Federal judge" (Jekyll 2006).

land entirely dedicated to "adult" activities called *Zindra*. It seems unnecessary, at this point, to say again that every time the web offers a suitable Sadian environment (isolation, secrecy, unrealistic imagery), this has disinhibiting effects and attracts people inclined to experiment (albeit in a simulation) with extreme sexual deviations.

The aspect of interest to us in the way *Second Life* works lies in that the written word continues to have a leading role, given the poor quality of the avatars and the virtual environments in the world of "cartoon sex" (Waskul and Martin 2010; Boellstorff 2008). Although it allows for a body to be built with made-to-measure sexual traits to match anyone's desires, by "buying" genitals and sexual capabilities from special shops, the *Zindra* red light district ultimately works like an illustrated chat service, where unrealistic, clumsy images of the self- accompany the written content of instant messages that are needed to describe sensations and emotions, and to give and receive instructions.

It is not only the *Massively Multiplayer Online Games* (MMOGs) created for other purposes - like *Second Life* - that offer the opportunity to create virtual worlds dedicated to sex. Some MMORPGs have already been designed for this type of use, such as *Pangaea, Evil Dead, F.E.A.R., Phantasmagoria, The House of the Dead: Overkill, World of Warcraft*. Some contain scenarios in which extreme forms of violence can be perpetrated (torture, mutilation, even cannibalism), while others are used for staging episodes of rape and incest. But the environment that condenses in a single game many of the characteristics only briefly hinted at elsewhere is *Sociolotron*.

> "We wanted the player to be able to do things that are also possible in real life, although he would probably never want to do them in reality, because they are evil and would cause punishment outside the content of an adult game. (…) the *Sociolotron* adult game contains sex, politically incorrect behavior, blasphemy, and lots of other things which are not acceptable to many people. This game allows you to bring out your darker side" (http://www.sociolotron.com).

This is a perfect Sadian place where the characteristics that we have discussed so far come together in a single virtual environment and are advertised to attract customers (the fee for *Sociolotron* users is in the range of $8-$10 a month). "Iron rules" are imposed: it is strictly forbidden to create scenarios or refer in any way to the realms of pedophilia, and it is not permitted to draw any kind an advantage from the game in real life.

The whole course of our analysis thus comes full circle and returns to the starting point. *Sociolotron* is the universe described in Sade's novels made accessible to anyone willing to pay the entrance fee and take part as a co-author. Within this fictitious world, avatars who cannot be persecuted for their actions dedicate themselves to the experience of abuse, violence and extreme sexuality, just as Sade did with his characters. *Socio-*

lotron can be seen as a *Libertine Zone* that is no longer *temporary* like the chat sites, however, because it has become institutionalized, a clearly-defined, specific "place*" à la* Augé (1995). With time, it has built up its collective story and gives users the chance to develop a dense network of often conflicting relationships: "You can be permanently killed. You can be put away into prison for some weeks! You can even be forced into prostitution or drug abuse" (on the emotional and behavioral effects of the game, see Whitty et al. 2011, Gutiérrez 2014).

We have come a long way from the stories filed on *alt.sex.stories*, however. Although *Sociolotron* has the structure and constraints of a game, with previously-written scene plays that can be interpreted using avatars, the types of behavior suggested and inspired in this environment go well beyond what many players might have ever expected to be able to virtually experience.

6. Back to the Past: Revisiting the Chat Sites

At this point, it is useful to conduct a further test our original hypothesis, i.e. that the set of artifices invented by Sade in his novels (isolation, secrecy, unrealistic imagery, disinhibition) are a constant feature of the various modern media described here, from the printed matter to *Sociolotron*. Wherever the conditions are right for these resources to be provided, a more or less temporary *Libertine Zone* is created that is steeped in the spirit of Sade, whatever the technical medium hosting it and enabling it to develop. In other words, the succession of different environments (BBS, chat rooms, MMOGs and MMORPGs) does not necessarily give rise to a hierarchy in which more modern media prompt the decline and disappearance of the older platforms. It may even be that the opposite occurs, that remnants of the past serve precise social functions, one of which is provide a solution for those who lack the skills needed to immerse themselves in *Second Life* or other such virtual worlds.

To test our hypothesis, we conducted an empirical research on several sites in the IRC network during the months of July and August 2014, and on other chat services elsewhere on the web, where users are allowed to chat about whatever they wish. We gave priority to chat rooms that recall Sadian topics in their names, even without any direct reference to BDSM (e.g. *blasphemy, extreme sex, amoral sex, incest*), and to references to Satanism or neo-Nazism with explicit erotic objectives. This approach led us to interact with a number of people and gain an idea of how *Temporary Libertine Zones*, created in the setting of "blind" chats (without using webcams or microphones), are used today. The chats considered were all in the Italian language and explicitly erotic.

6.1 Method

We conducted our empirical research in three separate phases.

Phase 1: silent observation of the messages circulating in the public part of the chat sites. Aim: primarily to become familiar with the jargon and the meanings to which users' nicknames allude (some chat sites also include written user profiles) to establish the boundaries within which participants represent themselves and their actions; and, as a secondary goal, to gain an idea of their age, gender and sexual orientation. This part of our survey was conducted of the course of one week, at three different times each day, and for approximately an hour each time[3].

Phase 2: introducing ourselves in the public part as inexpert newcomers, asking to be guided/initiated into the use of the chat room. Usually after two or three attempts, we would find somebody willing to act as our "companion" (there seem to be plenty of users of who find pleasure in taking novices under their wing, providing the newcomer is determined). The researchers naturally had to introduce themselves using an identity suited to a novice. Aim: to examine the rituals of the interactions and the classes of the proposed actions; to understand what types of fantasy are described. In this setting, conversations can be struck up in which several individuals spontaneously provide details about the main categories of visitors to the site, the words and sexual situations that are allowable, the ones that trigger negative reactions, and so on.

Phase 3: pooling the information obtained from the various available sources (the public part of chat sites, user profiles, and exchanges with our "guides") to obtain appropriate models and interpret our findings. The three stages of our study were conducted adopting a "virtual ethnography" approach, following the methodological framework suggested by Hine (2000).

6.2 Ethical Issues

As Waskul et al. (2000, 382) wrote, while it is true that "it would be unethical to observe on-line participants engaging in cybersex without their knowledge and permission", it is equally true that it would be "unethical to conduct on-line research in such a way as to overtly and knowingly disrupt the context of one's research". Since the privacy of the people with whom we came into contact was never invaded and we have no way of inducing them to behave in any unethical or hazardous way, we believe that here (as on other occasions), we behaved in the best way to safeguard the interests of the individuals with whom we interacted, and to achieve reliable findings. In settings such as the sites that we temporarily

[3] The chat service allows for several rooms to be kept open at once, and for a user to take part in several public chats simultaneously using the same nickname.

visited, if we had introduced ourselves as researchers we would not have been taken seriously, or we would have been rejected. In both cases, this would have been disruptive and we would have been perceived as trouble-makers with the smooth functioning of the chat site. We consequently feel that, by ensuring the anonymity of the people contacted and underscoring that the chat sites involved are open to the public, our working method was ethically and pragmatically the best solution to adopt in the situation – much the same stance was taken by Shoham (2004) and a similar study was conducted by Lamb (1998).

6.3 Main Outcomes

As always happens with chat sites, the first exchanges of messages serve to take stock of one another, to gauge who is on the other end of the line, how much you can "reveal" yourself, and how far you can take the conversation (Mills 1998). In our case, introducing ourselves as novices with no knowledge of how the chat room functioned, but well aware of the types of topic being discussed made it easier for us to induce processes of *disclosure* and *disinhibition*, and gain the trust of the people we chatted with. Our "guides" were initially cautious, but soon became willing to give us a broad idea of the chat site's uses and customs, and the topics most often discussed in the exchanges.

This enabled us to collect the information we needed, interrupting the conversation when we felt we had achieved our aim, or when the exchange tended to involve us excessively in any fantasizing.

Our analysis of the "blind" chats confirms that Sade's influence is still very strong when various kinds of *Temporary Libertine Zone* are set up so that the parties involved can feel free to talk to each other about their fantasies. The fundamental ingredients (already mentioned several times) circulated by the various media are always much the same: an isolated "place" is prepared (the chat room) that outsiders and laypeople cannot enter; users are assured of secrecy and anonymity, they access the site with a nickname and revealing only their age, gender[4] and erotic inclinations; users create radical fantasies in their interactions with one another, everyone acting as a co-author of the story; the sense of freedom and disinhibition leads users to imagine extreme situations and construct ad hoc victims, and speak of sacrificial homicide (Satanists), collective persecution (neo-Nazis), profanation (blasphemers), incest, possession and orgiastic exchange of bodies (depraved, amoral); and, finally, the physical-anatomical and social unreality of the protagonists and situations described gives rise to the representation of implausible, pragmatically impossible scenarios.

This picture is largely consistent with what happened in the BBS and

[4] Users can naturally lie about their age or gender, be it to protect their identity and/or (as in our case) to achieve a particular goal in the course of the interaction.

newsgroups of the 1990s, which naturally leads us wonder why, given the resources available today (from the worlds of virtual reality to role-playing games), people are still using such old platforms as "blind" chats to live an adventure that would essentially seem rather restrictive by comparison with what they can experience elsewhere.

The answer focuses above all on the last of the Sadian traits that we illustrated the earlier. More than anonymity, secrecy or freedom to express erotic urges, the key element that seems to justify the choice of chat sites is the individual's substantial inadequacy when it comes to using other environments. Although they defined themselves as "Satanists", "neo-Nazis" or "blasphemers", many of our respondents said they do not belong to any groups, organizations or communities in the real world with any connection to the roles they attribute to themselves in the chat room, borrowing from what they have heard via the web, at the cinema, or on TV. Even those who identify themselves as "incestuous", "depraved" or "abnormal" do so without being able to boast any real-life experiences of such behavior. Sometimes they openly admit as much, and sometimes this emerges from the implausibility of their stories, which are often all the more unbelievable – taking on the features of genuine "stories" - the more they are purported to refer to so-called personal life experiences. As Lamb said in 1998, such stories are sometimes *told*, and sometimes *impersonated*, so the theatrical function of the chat rooms remains, and even seems to be one of their most appealing features.

We might also wonder why someone should prefer to speak about a given scenario in minute detail in a chat room if they really have the opportunity to experience it "in the flesh" (as chat users often claim to do in describing their so-called experiences). Asking such a question directly almost always led to the exchange being interrupted because it introduces a heavy dose of realism in a setting where there is a tacit agreement that anything imagined by anyone shall be taken at face value. Taking part in the chat thus becomes the tangible sign of a two-fold limitation: on the one hand, there is the inability to look at one's own fantastications, and acknowledge them for what they are, instead of presenting them as authentic chapters of a person's biography; on the other, there is the inability to exploit more refined communication media to enjoy these fantasies in a sophisticated virtual environment. It has to be said that chatting can have an enormous expressive force in inventing situations and circumstances, whereas in *Second Life* or *Sociolotron* - despite the "physical" use of an avatar - it is necessary to comply with constraints dictated by the program. But none of the people we spoke to reported knowing of anybody who used MUVEs or MMORPGs in parallel with, or instead of the chat room.

The paraphilias and militancies that we encountered were mainly imaginary, unrelated to any sects or real-life meeting places or organizations, though the speakers referred to imaginary forms of them. Satanists, neo-Nazis, blasphemers, amoralists and perverts interpreted their roles in

their own self-referencing way. During the ethnographic work, we had the impression that they were translating into stories or impersonations a generalized condition of *lurker* (or voyeur of other people's lives), already living in a condition of social, sexual and technological segregation that compounds the isolation permitted by the chat room. Their separation from the real world, of which they seek to impersonate certain roles, parallels their active participation in *Temporary Libertine Zones* where they can be transformed into ferocious torturers of their poor victims or (in rare cases) even have a taste of being victims themselves.

This description amply confirms the quotation from one of Sade's letters under the title of this article: the chat room users who spoke to us are not there because they are unable to actually implement the excesses they describe, but because they can only experience them intensely in the manner permitted by the web. "To put it most simply, the sexual activities are imaginary, but the sexual pleasure is real" (Mills 1998, p. 43).

While it is true that the topics and models in circulation retain the Sade's original pattern virtually unchanged from the point of view of the recipients and the practical usage of the material, the switch from one medium to another, from printed matter to the chat room, radically transforms its meaning. There is much the same difference as between the 18th-century aristocratic libertine book-writer and the 21st-century loners sitting in front of a computer in their own rooms.

7. Conclusion

"Extreme" erotic stories have been circulating in Internet since the *alt.sex.stories*'s start in 1992, evolving over the course of two decades from stories written and exchanged via Usenet to "theatrical" roles enacted in chats or with sophisticated avatars moving in especially-designed virtual environments. During the course of this evolution, the erotic patterns in circulation seem to have remained much the same, with certain common features (isolation, secrecy, unrealistic imagery) that enable their reproduction using the various different formats. The technological advances (from the BBS to *Sociolotron*) have made Sade's orgiastic fantasies accessible to a much larger audience of users also making it easier from them to come into contact and interact with one another. The latest technologies have contributed to this process of circulation in two directions. On the one hand, the result of combining several types of platforms has made the sexual encounters described ever more realistic (with the aid of video cameras and microphones, and/or by developing the physical features of avatars). On the other, the libertine forms of desire can be anchored to media that, in many other respects, have become obsolete (take the case of "blind" chats, which provide the greatest assurance of anonymity and personal protection.) These two paths coexist in the same virtual time and space, but on the basis of our findings, they are now articu-

lated through several different ways and increasingly specialized uses.

In both processes, however, the written word remains the primary means of communication, capable of circulating from one place to another, and from one time to another, persisting, increasingly consolidated, and continuing to serve as the instrument of choice for mobilizing the emotions and fantasies of the writers and readers of stories on *alt.sex*, and of those experimenting with the avatars of *Second Life* or *Sociolotron*. The "Sadian collective intellectual" consists of thousands of individuals, engaging in their erotic practices, who unwittingly take part in collecting and reproducing "extreme" desires and pleasures that remain much the same, in terms of content, even if the form they take changes thanks to modern technology. The process seems to go on without breaking away from the past, apart from the jump from the well-protected secret diffusion of a highly-cultured literary product in the 18th century to performances enacted by ordinary people on the web. It is therefore the imagination, aroused by verbal accounts, that closes a centuries-old circle of steps that lead from Sade's fantasies and his characters in *The 120 Days of Sodom* to modern-day libertines whose virtual environments revive and renew the self-same pleasures.

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Science Communication and Science in Society: A Conceptual Review in Ten Keywords

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Abstract: Originating in science outreach and influenced by social studies of science, science communication is now an established field of graduate education, of empirical and applied studies and of theoretical reflection. The establishment of this field has been marked inter alia by the publication of dedicated journals, reference books and handbooks, and the organisation of regular international conferences and professional networks. The process reflects developments in science-society relations as expressed, for example, in notions of post-academic, post-normal, or mode-2 science, all of which posit the permeability of the previously conceived boundaries, leading to more communication between institutions and between the cultures of science and of institutions and the culture of the wider society. In this article we have selected ten terms that are frequently used in the public, professional and policy discussions about questions of science in society.

Keywords: science communication; science in society; lexicon; trends and challenges; conceptual review; keywords

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Over the past three decades, government and institutional programmes and professional and voluntary practices in public communication of science have multiplied and diversified. With their proliferation and their spread around the world, an associated educational and research endeavour has also grown. Originating in science outreach and influenced by social studies of science, science communication is now an established field of graduate education, of empirical and applied studies and of theoretical reflection. The establishment of this field has been marked inter alia by the publication of dedicated journals, reference books and handbooks, and the organisation of regular international conferences and professional networks. The process reflects developments in

science-society relations as expressed, for example, in notions of post-academic, post-normal, or mode-2 science, all of which posit the permeability of the previously conceived boundaries, leading to more communication between institutions and between the cultures of science and of institutions and the culture of the wider society.

The term 'science communication' has stabilised in the past two decades as the preferred descriptor for this field of practice and theory. Out of 79 papers, essays and chapters published over seventy years that we selected for an anthology of writings on public communication of science (Bucchi and Trench 2016), 21 referred to 'science communication'; just two of those were published before 1995, and the rest were published in that year or later. Recently, 'science in society' has come to be used as a near-synonym, though sometimes intending to make explicit the dimensions beyond talking, exhibiting or writing science, such as policies and practices in public consultation on science-based issues, science policy or research agendas.

This possible ambiguity reflects the nature of the developing field, as does the shifting terminology for some central phenomena. In this article we have selected ten terms that are frequently used in the public, professional and policy discussions about questions of science in society. We set out in lexicon-like form how these terms have acquired a range of meanings, including distinctly different ones, some of which co-exist in current usage. With a firm grasp of these terms, and an appreciation of how they may be deployed normatively, descriptively or analytically, the reader should be better placed to navigate the field of science communication research and policy-making.

The following glossary does not propose stabilized or final definitions of the selected terms, but rather aims to make their variable usage more transparent.[1] A lexical exercise of this type is clearly limited when it is based on terms that are prevalent in the English-language literature. Both authors of this article work in multi-lingual contexts and are keenly aware of this limitation. However, it is also the case that English-language terms in this field have been widely used in international discussions, either in direct translation or in their original form. We offer this conceptual review based on our knowledge of the literature and our participation in relevant discussions. We have included references to sources for some arguments and illustrations but we considered it would have made for difficult reading if we attached references at all possible points. We open the review with one of the longest-established (and still-used) key terms and, beyond that, the sequence of the review aims to link each section with the next or previous one by broadening the argument.

[1] This article draws on the work done by the authors for the *Annuario Scienza Tecnologia e Società* 2014 and the *Handbook of Public Communication of Science and Technology* (Bucchi and Trench 2014a; 2014b).

Popularisation

This is the term with the longest tradition among those used to describe a wide range of practices in making scientific information accessible to general, non-expert audiences. The near-equivalent terms in other languages, including *vulgarisation* (French), *divulgazione* (Italian), *divulgación* (Spanish), also have long and continuing histories and carry similar connotations. Early examples of popularisation – though not named as such at the time – include Fontenelle's *Entretiens sur la pluralité des mondes* (1686), a series of conversations between a philosopher and a marquise. During the 18th century, science popularisation gradually defined itself as a distinctive narrative genre, often targeting in particular female readers as supposedly ignorant and curious – "symbols of ignorance, goodwill and curiosity" (Raichvarg and Jacques 1991) – as in Algarotti's classic *Newtonianism for Ladies* (1739) or de Lalande's *L'Astronomie des Dames* (1785).

Further channels of popularisation emerged later, with scientific discoveries frequently featured in the daily press, science museums, public lectures and the great exhibitions and fairs that showed visitors the latest marvels of science and technology. Particularly during the second half of the 19th century, popularisation and popularisers profited from changes in the publishing business and the increasing reading audience to become influential voices, but their success also testified to the increasing relevance of science as a cultural force. The sales figures of Brewer's *Guide to the Scientific Knowledge of Things Familiar* – 195,000 copies up to 1892 (Lightman 2007) – are impressive even by contemporary standards. Through their books and public lectures, popularisers ("showmen of science") like J.H. Pepper and J.G. Wood in England or Paolo Mantegazza in Italy became public celebrities of their time (Lightman 2007).

In the following century and particularly after World War II, the new global and policy landscape redefined popularisation in conceptual and even ideological terms, particularly in the US and Western Europe. With science's social and political role significantly captured by the metaphor of the "goose laying golden eggs" – e.g. delivering economic wealth, social progress and military power if appropriately fed – popularisation was expected to "sell science" to the broader public to strengthen social support and legitimation (Lewenstein 2008). The goose metaphor was coined by Vannevar Bush, scientific advisor to the US government during World War II, and author of an influential report (Bush 1945). The approach he, among others, proposed fueled the development of popularisation strategies and channels, including interactive science centres and partnerships between science institutions and Hollywood studios.

When a new phase of critical reflection on the role of science in development and (more broadly) in society opened, spurred by environmentalist, anti-war and anti-nuclear movements, the concept of popularisation also came under criticism as embodying a paternalistic, diffusionist

conception of science communication (Hilgartner 1990). More recent conceptualizations have reappraised the term, considering it suitable to describe specific types and contexts of communicative interactions among science and the public, for example, situations characterised by low public sensitivity or mobilisation, moderate perception of controversy among experts, and great visibility of science actors and institutions involved (Bucchi 2008). In China, "popularisation" has long been, and remains, the preferred term to refer to a wide range of science-in-society activities.

Model of communication

This is one of the key theoretical concepts in science communication. Despite this, only a few explicit models of science communication have been designed and proposed. Over twenty years ago, sociologists and communication identified theoretical and conceptual problems in the dominant practices in popularizing science (e.g. Dornan 1990; Wynne 1991). They referred in this context to the model of communication underlying such practices, meaning the hypothetical construction, by the initiators of communication processes, of the relations between the actors involved. These critiques identified the dominant model in terms such as 'top-down' and 'hierarchical' and pointed to the assumption that the target public was defined by a deficit (see Deficit below) of some kind.

Over the past two decades, science communication communities in research and practice have sustained a discussion about the limits of inherited models and about the characteristics of models that are more appropriate for the present day. Part of that discussion and research has been explicitly prescriptive and binary: it labels some models of communication, specifically, the deficit model, as old and discredited and others, such as dialogue models, as new and appropriate. In this context, the shift in preferences from one model to another is represented as evolutionary and irreversible.

However, another side of that discussion and research, more descriptive and analytical, has been aimed at understanding better the range of possible models, how different models are applied, how the language used to describe a practice may disguise the model that effectively shapes the practice (Wynne 2006), how different models can co-exist (Miller 2001; Sturgis and Allum 2005), and what governs the choices made. Some attempts have been made to set out a wide spectrum of models, incorporating more tightly defined options that might apply in specific and changing circumstances (Trench 2008).

Deficit

This is a central concept in identifying the intellectual (or ideological) foundations of some science-in-society ideas and practices and enabling their critique. Two assumptions often underlie this concept: public opin-

ion and political decision-makers are misinformed about science and the issues raised by its development; this misinformation is fuelled by inadequate and sensationalist media coverage of technoscientific topics. This situation is seen as being exacerbated by poor training in basic science and a general lack of interest among the institutions and the cultural intelligentsia in scientific research – in this last case, most famously by British scientist-author, C.P. Snow (1959) in his treatise on "two cultures". Consequently, citizens and political decision-makers are seen to fall prey to 'irrational' fears which fuel their hostility and suspicion towards entire sectors of research and technological innovation (e.g. nuclear energy, genetically modified foods, stem cells).

From this perception arises the need for initiatives bridging the gap between experts and the general public, reversing public attitudes towards science and technology or at least attenuating their hostility. Such emphasis on the public's inability to understand the achievements of science – according to a model of linear, pedagogical and paternalistic communication – has warranted the label of 'deficit model' for this view of the public understanding of science (e.g. Wynne 1991; Ziman 1991).

From the early 1990s, scholars such as those just named have criticised the deficit approach by highlighting the weak empirical foundations of its assumptions and the limited results achieved by the communicative actions it has inspired. Critics of the deficit-based approach do not deny that relevant awareness problems may exist across publics (see Publics below) on issues related to science, but suggest that this is not the best starting point: researchers should focus instead, they say, on what the audiences do know, and on their questions and concerns.

Discussion has continued over many years on what kinds of knowledge about science the public generally lacks and needs to have: knowledge of scientific fact, of scientific theory, of scientific methods, of the organisation and governance of science, or, more colloquially, of how science works and how science *really* works (see Durant 1994). However, the notion of absent knowledge of facts, expressed as a low level of scientific literacy, or scientific illiteracy, remains widely assumed in contemporary science-in-society practice, notably in contexts where there are perceived problems of anti-science, pseudo-science and superstition, as, for example, in Indian programmes of science awareness (Raza and Singh 2013).

Dialogue

Dialogue came to be presented as the acceptable alternative to the deficit model from the late 1990s. As public concern over specific science and technology issues became evident – sometimes despite significant promotional efforts – the demand for scientists to become involved in public discussion of such issues increased. Multiplying examples of non-experts or alternative experts actively contributing to shape the agenda of

research in fields like biomedicine have led to rethinking the very meaning of science communication in several arenas. A frequently cited report of the House of Lords (2000) in Britain acknowledged the limits of science communication based on a top-down science-public relationship, and detected a "new mood for dialogue". In many countries and at the European level, funding schemes and policy documents shifted their keywords from "public awareness of science" to "citizen engagement," from "communication" to "dialogue," from "science *and* society" to "science *in* society".

The claimed shift from deficit to dialogue remains a powerful narrative in public communication of science. The two approaches are widely seen as distinct and one as inherently superior to the other. The shift is often stated as an irrefutable fact: commentaries speak of the "dialogical turn" as a historical change that has taken effect across Europe, and more widely (e.g. Phillips et al. 2012). Dialogue and related approaches are now much more frequently proposed and enacted than those that might be defined as deficit-based, at least in Europe, Australasia and North America. However, closer examination reveals a complex picture; for example, the striking case of Denmark – for decades very strongly associated with pioneering dialogical initiatives – where there is an apparent reversal of the trend (Horst 2012).

The study of this case links to a thread running through the research and reflection of the last decade of skepticism about the scale, or even the reality, of the claimed shift to dialogue. It has been suggested, for example, that dialogical approaches may be used in order to more effectively remedy public deficits. It has been argued that some dialogue methods are not genuinely two-way or symmetrical, in that the original sponsors of the communication (generally scientific or policy institutions) stay in control and the citizens taking part have no significant influence on the final outcomes (Davies et al. 2008; Bucchi 2009). There is yet another strand to the discussion and to the communication and cultural practices; this draws attention to the possibilities and pleasures of dialogical events which are not oriented to specific political or informational end-goals, but rather to the process of "taking part" (e.g. Davies et al. 2008). In science cafés, a spreading form of science communication (see Einsiedel 2014; Trench et al. 2014), for example, the satisfaction of those involved may reside in the exchange itself rather than anything beyond it, such as acquiring and processing formal scientific knowledge.

Engagement

In the context described under Dialogue, Engagement has become in many countries, particularly English-language countries, a prevalent and inclusive term to describe a wide range of science-in-society practices in policy, educational, information or entertainment contexts. 'Public engagement' has become a label for organisational units and individual roles

within organisations; it can refer to the actions and attitudes both of knowledge producers and of various sectors of the public. When researchers, for example, go to the streets to talk about their work, this may be called "public engagement". Equally, the attention and interest shown by their audiences may also be called "public engagement". Especially in Britain, public engagement is as comprehensive a term as public communication; the acronym PEST (public engagement with science and technology) is used as the catch-all term in preference to PCST (public communication of science and technology) or PUS (public understanding of science). The change of vocabulary carries with it, at least implicitly, a shift to an understanding of relations between the partners in the process as more equal and more active.

Different levels and modes of engagement are envisaged, for example, by reference to downstream and upstream engagement (Wilsdon and Willis 2004). The latter has been proposed for priority attention, on the basis that early involvement of the public in discussion and eventually negotiation of new developments in science and technology will likely lead to more satisfactory outcomes for all involved, and specifically to knowledge that has earned public trust. The case of genetically modified foods and crops is cited as an example of late, or downstream, public engagement; citizens in many countries across the world were presented with products ready for use and, in many cases, they reacted in a hostile manner. In Europe, in particular, governments, researchers and businesses applied what they saw as the lessons of that experience when they sought to ensure earlier (upstream) engagement with nanotechnology.

Public engagement activities are nowadays regarded in several countries as a relevant dimension of the mandate – as well as a responsibility – of research and higher education institutions in the context of the so-called "third mission", where "engaged research" or "engaged universities" are frequently referenced. This development has been further reinforced by the European Commission's adoption and advocacy of the concept of responsible research and innovation (RRI). On this basis, scholars and policy-makers are discussing the most appropriate indicators to identify and analyse the range and impact of such activities (Bauer and Jensen 2011; Bucchi and Neresini 2011).

Participation

Through association with ideas of participatory democracy and participatory communication, Participation has come to be used in science-in-society to represent a stronger form of engagement by the public both with scientific ideas and with the governance of science. In these contexts, participation implies strongly active citizens, who can take part in many ways and at many levels, including in deliberation on the very topics for negotiation and communication. Thus, participation tends to be

used in science-in-society to refer to a third option that goes beyond the deficit-dialogue binary split and overcomes the need to refer, for example, to "real dialogue" in order to insist on the authenticity of the process (e.g. Riise 2008). If deficit and related modes of communication can be considered one-way, and dialogue two-way, then participation can be represented as three-way, because it implies publics or citizens talking with each other as well as talking back to science and its institutions.

In the European Commission's latest framework programme of research, Horizon 2020, valid for 2014-2020, support is being given to exploration of participatory mechanisms for deliberating on science, including on agendas for science, where the main agents of public participation are civil society organisations. Some contemporary science centres seek to facilitate similar participation through articulation of relations between arts and sciences, offering cultural representations of science as open-ended and available for interpretation and critique (Schiele 2014). In this context public participation in science is equivalent to that of critical audiences at the theatre or in the concert hall.

Yet other forms of public participation in science are represented by "citizen science" and "open science" (Bonney et al. 2009; Delfanti 2013). In the first, citizens may contribute to scientific research as collectors or contributors of data, for example adding observations of certain animal species to an online database to be later analysed by researchers; in the second, researchers make all protocols, data, analyses and publications available online for public scrutiny, allowing the interested public to access not only "ready-made science" (as was typically the case in popularisation) but also "science-in-the-making". In some cases, this accessibility paves the way for an actual contribution in terms of scientific content – historically and currently in amateur astronomy, more recently in ornithological or biodiversity field observations, and in various applications of 'hacking' (Einsiedel 2014; Delfanti 2013).

Publics

This plural form has become common in discussion and study of science-in-society, indicating in shorthand that "the public" is multi-faceted, even fragmented. Because it is not a common, much less everyday, word, "publics" often carries quote marks around it that draw attention to its deliberate use. Adopting the plural form was an important part of recognising that generalisations about the public – specifically in terms of its deficits – are very rarely valid, and often seriously misleading (Einsiedel 2000). Referring to publics has been associated with the proposal of a contextual model of communication (e.g. Miller 2001), according to which the communicators inform themselves about, and are attentive to, the various understandings, beliefs and attitudes within the public.

Beyond the demographically-based differentiation of publics as young or old, male or female, and scientifically educated or not, the plural-

publics approach has been supported by the accumulation of evidence on the widely varying interest, attention and disposition towards scientific matters by the populations of individual countries and, comparatively, across countries and continents. From surveys of public knowledge of scientific facts initiated over fifty years ago, these studies of publics have become increasingly sophisticated and nuanced. They measure fine distinctions within and between national populations on, for example, levels of trust towards scientists and scientific institutions and attitudes to emerging technologies. They allow such attitudes to be correlated with educational experiences and world-views. On the basis of cross-country analysis of survey findings, the patterns of national cultures of science (see Scientific Culture below) can be sketched (e.g. Allum et al. 2008; Bauer et al. 2012). A strong focus on publics is almost standard now in the training of scientists for public communication; short courses offered to researchers by research councils, universities, professional organisations and others very often start by asking: who are the publics you want to communicate with, and why (Miller et al. 2009)?

Expertise

One of the most common forms through which scientific knowledge and actors enter the public domain is as "expertise", when scientists take on public roles validating, interpreting, and commenting on developments in science, and advising governments and other social institutions on their implications. As producers of knowledge, scientists tend to operate in tightly circumscribed and increasingly specialised spaces. When scientists are called on to be experts in public arenas, they are expected to take a broader view and answer media questions or offer policy advice on themes in which they may not be strictly competent (see Peters 2014).

Studies of science in society have often focused on how scientific expertise is expressed and becomes a recognized authority in public. Increasingly, expertise of several kinds is involved when complex scientific issues are played out in public arenas. Contemporary developments in science, such as those in the nano-, bio- and neurosciences, typically happen at the interfaces of several scientific and technological specialist practices. Sometimes they also have political, economic or ethical implications which invoke contributions from experts in those fields. Scientists active in public communication are increasingly required to relate their own expertise to that of scholars and practitioners in topics that were previously considered remote, sometimes even antagonistic. When complex environmental and medical matters are negotiated through legal or parliamentary systems, perhaps with a view to establishing constitutional ground rules or setting down regulations, scientific expertise may be scrutinised in contexts and by criteria very different from those of the natural-scientific communities.

Scientific expertise has come to be further problematised by reference to the tacit, less formal, knowledge that various social groups possess through their experience or culture. In case studies in health and agriculture in the 1980s and 1990s, the term "lay expertise" (or "lay knowledge") was coined to refer to the knowledge that, in these cases, patients and farmers brought to a particular issue and that qualified the definition of that topic given by scientific experts (Wynne 1992; Epstein 1995). On the other hand, ripostes to that approach have insisted on the attribution of expertise only to those with formal qualifications (e.g. Durodié 2003). Scientific expertise in contemporary societies is being challenged by factors like expanded accessibility of specialist information to non-experts, increasing questioning of the choice and competence of experts, and public exposure to controversial specialist debates and competing expertise. Technological developments, specifically the proliferation of Internet forums and platforms, are making the "extended peer review", that was envisaged two decades ago, more real.

Visible Scientists

Public or visible scientists have been present in every generation since modern science emerged in the 17th century. Some of the founders of modern science were visible public figures, and some of the earliest institutions of modern science such as professional societies and academies dedicated themselves, at least in part, to making the achievements of science visible and public. However, those who did science were not defined as "scientists" until the 19th century and, up to then, the potential public for science was restricted to a shallow layer of the highly educated. With the professionalisation of science, the rapid growth in the number of scientists and the development of a mass public, a particular concern grew about the relative invisibility of science: the vast majority of science and scientists were invisible to the vast majority of society. A classic American study (Goodell 1977) coined the term "visible scientists" when it drew attention to selected scientists in psychology, anthropology, molecular biology, and other fields who had achieved public visibility as informers and explainers of contemporary science. But it also highlighted institutional constraints, which meant that scientists might be punished as often as rewarded for seeking such visibility.

From the 1950s, developments in society required scientific expertise to be more accessible. The space race engaging the two major geopolitical blocks drove efforts to increase public investment and interest in the new scientific and technological discoveries and conquests. Rapid developments in medical science and in information technologies needed explainers. The most successful popularisers exploited the opportunities of the rapidly spreading medium of television to become household names. In astronomy, new technologies and natural history, in particular, photogenic or otherwise charismatic scientists developed highly visible

careers as TV presenters. Some others, called on to be expert sources for the political and media systems, became public scientists in myriad ways, as newspaper contributors, TV show panellists, advisory committee or expert group members, and as politicians.

From the 1970s, governments around the world created ministries of science, technology or research and individual scientists were drawn into the political systems as ministers or advisers. The strength of presence of such public scientists – whether in media, politics or public affairs more generally – and the features of their visibility may be taken as a relevant dimension to analyse a country's scientific culture (see Scientific Culture below). Fueled by further developments of mass media, the celebrity culture that grew up around entertainment and sport has affected many other sectors; many societies have their celebrity scientists, just as there are celebrity actors, authors and economists (see Fahy and Lewenstein 2014; Fahy 2015). Their views are sought and broadcast on topics well beyond their areas of recognised expertise and their private lives become public affairs: it is also through such dynamics that the deepening interpenetration of science and society that characterises contemporary scenarios takes place.

Scientific Culture, Culture of Science

Several variations of these terms are used to refer to the standing of science in the general culture of a country or other cultural context. Two interconnected uses of the term have largely dominated debate in the past few decades. One use, significantly influenced by Snow's concept of "two cultures", contrasts scientific culture with that of the humanities and the arts, and it deprecates their separation and the lack of public attention for scientific culture (Snow 1959). The second use has been almost interchangeable with "public understanding of science" in its more traditional and limited meaning. This equates scientific culture with public attention to and interest in scientific topics and levels of scientific literacy and thus, through a deficit and diffusionist perspective, to public acceptance and support of different science and technology developments. Such usage has been extended to encompass technology explicitly, as in the French term *culture scientifique, technique et industrielle*, generally shortened to CSTI, or the European Commission's chosen term for a short period, "RTD culture", referring to research and technological development (Miller et al. 2002).

The narrow, diffusionist interpretation of scientific culture takes for granted, in a similar vein to Snow, that scientific culture can be defined as a distinct, coherent and monolithic object that can be infused or injected into general culture and society through appropriate communications. This view has been widely criticised as limited and unfounded on several grounds (see Deficit, Models above). Empirical studies have shown that concern for and skepticism about certain scientific developments may ac-

tually be associated with higher levels of literacy and information (thus, in one usage, stronger scientific culture) and vice versa, that blind trust – and in some cases even expectations of 'miracles' – with regard to science can be largely disconnected from actual knowledge and understanding (e.g. Bucchi 2009; Bauer and Falade 2014).

A more comprehensive view underscores increasing diversity and fragmentation within science practice; significant permeability of the boundaries between contemporary science and society; cross-fertilisation between images and narratives in general culture and scientific concepts and ideas; significant visibility and presence of scientific figures and concepts in the public sphere as well as in contemporary arts. This culture of science in society encompasses not just understanding of specific scientific content, but also an awareness and social intelligence of science as part of society and culture, and an ability to discuss and evaluate science's role, priorities and implications in an open, balanced and critical fashion. Also more recently, but in a more technically-oriented fashion, a discussion has started on defining indicators to "measure" scientific culture as a combination of traditional indicators (e.g. R&D investments and output), indicators of science communication activities (e.g. media coverage intensity, science museum visitors) and of public attitudes to science.

Recent Trends, Future Challenges

Contemporary changes require new approaches and possibly new concepts, models and research strategies: it is crucial to think about the reshaping of communicative relationships and, above all, to resist conceptualisations of science and society as separate and distinct from each other. This remains perhaps the central challenge for contemporary research on science in society but there are related challenges that arise from the co-evolution of science, society and communication media.

For example, permeability and heterogeneous networking between science and society intersect with the increasing fragmentation of publics, of media and of their social uses. Science institutions and actors are diversifying their attitudes and practices, also in the domain of communication, which makes it problematic to continue using traditional expressions like "scientific community", implying internal homogeneity and a shared commitment to specific norms and values (Bucchi 2009, 2015). But it is no less important to reflect on and investigate the diversity and articulation of the 'publics' of science communication. The traditional usage of 'public' evoked a notion of passive and target-like readers and spectators, often addressed and defined in marketing terms. But around public science events and technoscientific controversies there is much evidence of audiences as active participants, just as there is evidence that significant portions of the public may remain disenfranchised or alienated from interactions and participatory processes with regard to science. Social transformations, which are represented in characterisations of con-

temporary society as pervaded by uncertainty, risk or distrust, along with changes in media technology and use, are playing relevant roles in redefining and multiplying public spaces for science communication. These changes require research to develop more complex maps of the relations between sciences and publics.

Moreover, the traditional sequence of the communicative process (specialist discussion/didactic exposition/public communication or "popularisation") is increasingly disrupted. The didactic and public exposition of science is no longer, as in Kuhn's theory, a mere static and carved-in-stone page written by the winners in the struggle to establish a new scientific paradigm (Kuhn 1962). Even science museums, the places par excellence of 'fossilised' science, increasingly hold exhibitions on current and controversial science issues. Users of scientific information increasingly have access to science in its making and highly controversial debates among specialists. Some of the implications of this new scenario have been dramatically highlighted by cases like Climategate in 2009, when email exchanges among climate change researchers became available on the web, exposing internal communication dynamics traditionally confined to the 'backstage' of knowledge production processes: increasingly frequently, expert controversies unfold in real time and in public view. Research is required, more and more, to consider how and by whom the substance and the mode of such communication are shaped in exchanges within and between sciences.

Understanding these situations may benefit from renaming the object of science communication research as 'How Society Talks About Science'. This implies researching the cultural contexts – scientific, artistic, every day, and other – of such talk. The increasingly blurred boundaries of communication contexts should also encourage researchers to explore with more courage conceptual affinities and potential inspiration in the humanities, arts and culture, largely neglected by science communication scholars, despite the growing science/art practice. For example, concepts such as style may be relevant to understanding variety in science communication as well as addressing the challenge of quality (Bucchi 2013). This resonates with long-standing invitations to "put science into culture" (e.g. Lévy-Leblond 1996), emphasising its connections with other domains rather than its separation from society and culture, as expressed in models and visions of knowledge translation and transfer. It also invites us to recognise the importance of a broader culture of science in society that goes beyond familiarity with technical contents to include an awareness of its role, implications, aims, potential and limits. It eventually demands that not only society, the public and culture are problematised in their relationship with science, but that science problematises its own cultural premises. In this way, research on science in society can contribute to increased reflexivity within society and within science.

Research and reflection on science communication and science in society have traditionally suffered from disconnection with the broader area

of science and technology studies. Over the past few decades, however, concepts and approaches from STS have become more present and influential. Indeed, some of the works now regarded as 'classics' are works that have challenged longstanding stereotypes of the public, the media, and scientific actors from STS perspectives (see Bucchi and Trench 2016). At the same time, revisiting classical concepts (e.g. trust, community, authority, norms, gatekeepers) could provide new insights, in an STS or even broader social sciences perspective, on themes that were traditionally seen as limited to a specific, practical interest in communicating science to the public.

Building on and reappraising classical concepts by highlighting their relevance and transformation to face future challenges is an opportunity to look at science communication not only as a means to achieve certain objectives but as a central space to understand (and participate in) the interacting transformations of both science and public discourse. In this perspective, communication is not simply a technical tool functioning within a certain ideology of science and its role in economic development and social progress, but has to be recognised as a key dynamic at the core of those co-evolutionary processes (Nowotny et al. 2001; Jasanoff 2004, 2005), redefining the meanings of science and public, knowledge and citizenship, expertise and democracy.

Acknowledgments

The authors are grateful to Francesca Musiani and Annalisa Pelizza for their comments on a previous version of this paper.

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Alison G. Anderson
Media, Environment and the Network Society, London, Palgrave-MacMillan, 2014, pp. 203

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Any published book hopefully has different layers, which may suit different readers. A novel could be considered brilliant for the writing skills of the author, for the plot, and for the underlying message within the entire book. This is similar to what I felt once I finished *Media, Environment and the Network Society* by Alison Anderson from Plymouth University.

Anderson is a relevant contributor to the broader debate about environmental communication at the crossroads with studies of public opinion. Since the early 90s, she worked intensely on media coverage of environmental issues (Anderson 1991), focusing on both risk and natural hazard communication (Anderson et al. 2009; Anderson 2000). She often concentrated on environmental catastrophes, such as the Exxon Valdez oil spill (Anderson 2002) and the Prestige oil spill (Anderson and Marhadour 2007). Thus, it is not by chance that the cover of "Media, Environment and the Network Society" is a picture of the Deep Water Horizon Oil Spill, which occurred in 2010. Some key events in the global environmental governance, such as the UNEP Rio World Summit in 1992, have been relevant case studies during her career (Anderson and Garber 1993).

In a certain way, *Media, Environment and the Network Society* is an overview of Anderson's research interests and experiences in the field of environmental communication. The author redefines her early research questions, becoming conscious of the mutated scenario for communication. In the Introduction (p. 3), she declares: "Since I wrote *Media, Culture and the Environment* (published in 1997), the media landscape has considerably changed (…)". Therefore, a key motivation for Anderson was to update the studies on environmental communication to the most recent development of media technologies. She went further. Indeed, within this general purpose she integrated an empirically informed review of such theoretical approaches as risk society and network society. She used them to thoroughly survey the entire debate of environmental communication. This is a key point that makes the book worth consideration by a broad audience.

After the Introduction, the following chapter presents the theoretical background that will be recognizable within the entire book. Anderson examines a "new spectacularization" of environmental issues by describing the communication strategies of Greenpeace for the campaign "Save the arctic". This allows her to introduce the role of celebrities in environmental communication and to assess their contribution to the visibility

of a specific issue (e.g. climate change). The fairly large number of examples proposed allows the author to introduce two theoretical references that will motivate the subsequent chapters: risk society by Ulrich Beck and network society by Manuel Castells. What Anderson proposes is a critical review of these theoretical contributions. Risk is a key issue in communication and Anderson signals it as a specific topic for scholars in that field. Network society is a clear theoretical view that need to be tested through research. Regarding the former, as noted before by others (see Cottle 1998), Anderson observes that the media context has been often under-developed despite being a relevant brick of Beck's theorization about risk. For the latter, Anderson assumes Castells' theoretical proposal in his *Communication Power* (2009) as a good way to synthesis the media landscape configuration and its general functioning. Within this context, the configuration of power changes significantly depending on the level of access to the means of communication, the ability to define interaction rules, the opportunity to set-up its contents, and to further define the general aims. Accordingly, even environmental communication's peaks and agenda should convey of these processes. Within this frame, Castells, as Andersons pointed out, assumes that specific actors (tycoons, celebrities), who endorse environmental issues, are extremely influential in promoting salience and more likely to shift public opinion on said issues. Similarly, should big companies involved in hot crises, such as the BP Deepwater Horizon oil spill, decide to set up a specific representation (or not-representation in a spiral of silence) of a crisis it will overwhelm other actors leaving them little room. By recalling several researches dedicated to climate change and oil spill crises, Anderson offers a specific critique to this mutated "media landscape" and in general to Castells' assumptions, demonstrating how these processes can actually be configured differently. Indeed, as Anderson impressively demonstrates, celebrity endorsement of climate change does not necessarily shift public opinion significantly. On the other hand, actors who own more networked power, or the capacity to set up the agenda (Castells 2009, 44), are not by definition untouchable by those who have not. This is brilliantly shown in Chapter 5. During the 2010 oil spill in the Gulf of Mexico, the sky above Deepwater Horizon oil platform was interdict to flight below a certain height; basically, the spill extension could not be mapped by other sources except BP. In response to that, a group of activists in Louisiana launched a campaign to map the spread of the oil, aiming at sharing it on the web via real time images. They were successful in bypassing BP censorship strategies distributing a kit for launching helium inflated balloons equipped with digital cameras; indeed, they created an alternative infrastructure for information sharing about the oil spill crisis.

Before the conclusion, where Anderson sums up the main outcomes of her work, she includes a chapter about nanotechnology and synthetic biology as a new field to be investigated for environmental communication as well as risk representations. This deserved more space but the

book has been designed to be a dense but easily read one. In fairness, this chapter reviews previous studies on these emerging technologies (as the title of the chapter) and it is balanced compared to the others.

As I declared at the beginning of this review, I found different stimulating layers in this book. They might be all of interest for a variety potential readers.

A first layer, and the one that is the easiest to grasp, can be called the "review layer". It is for those that are unaware of the debate about environmental communication; this book offers a large amount of up-to-date references on the topic especially for those interested in climate change media coverage and on environmental "hot crisis" narration.

A second layer offers some methodological food for thought. Especially in chapter three there is a critique about robustness and representativeness of news media researches carried out through newspapers; it is rare to find criticisms on the choices of analyzing news-stories coverage through a specific newspaper or a selection of media sources.

A third layer is theoretical. I have already discussed above the criticism to Castells' postulations about networked society and the role of specific gatekeepers for information; however, it is worth noting how the thesis of Castells have been carefully explored as research hypothesis by Anderson both in a second level analysis and through original research.

A final layer I came across is less evident. Possibly, it represents the most interesting element for STS-oriented readers. It is Anderson's emphasis on the role of media technologies in the infrastructure of circulating information. Among the many examples she gives, the one of crowd-data to map 2010 of oil spill is maybe the most significant. Indeed, environmental activists aligned heterogeneous elements, such as DIY knowledge (for the small inflating balloons engineering), digital photography (the cameras), and the Internet (crowd-founding and free sharing of images) in order to gather and share first-hand data. This example, is not only relevant to critically deepen Castells' theories, rather, it is something that goes in the direction wished for by Brunton and Coleman (2014). That is to say, it goes closer to media infrastructure to understand media communication itself. Indeed, exploring such kinds of linkages between information production/sharing in the context of environmental communication could be an interesting way to expand connections between STS and media studies as well. This is currently a developing field, pioneering several contributions for both communities (Gillespie et al. 2014; Parks and Starosielski 2015).

This last layer may be hidden for Anderson too or, at least, it was unlikely at the core of her wishes. Perhaps it is something I recognised exactly because I was eager to find it. Anyway, as I hinted before, the richness of a book lies precisely in the *stimuli* that it can give to different readers. In my opinion "Media, Environment and the Network Society" positively succeeds in that.

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Antonio Arellano, Michelle Chauvet, and Ronny Viales (eds.)

Redes y estilos de investigación: ciencia, tecnología, innovación y sociedad en México y Costa Rica [Networks and investigation styles: science, technology, innovation and society in Mexico and Costa Rica], Ciudad de Mexico, Universidad Autónoma del Estado de México, 2013, pp. 306

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Redes y estilos de investigación: ciencia, tecnología, innovación y sociedad en México y Costa Rica has to be understood as the fruit of a collaborative experience in the Red de Estudios Sociales de la Ciencia y la Tecnología (RESOCTI). This is a research network shaped by three very active research groups from Latin America. Two of them are from Mexico: Cuerpo Académico Sociedad y Biotecnología, at the Universidad Autónoma Metropolitana Azcapotzalco (UAM-A), and Cuerpo Académico Sociología de la Tecnociencia, at the Universidad Autónoma del Estado de México (UAEMex). The third one is from Costa Rica: Programa de Estudios Sociales de la Ciencia, la Técnica y el Medio Ambiente, at the Universidad de Costa Rica.

The book is structured in three parts. The first section "Construcción tecnológica: agrobiotecnología y ofidismo" presents four case studies regarding biotechnological innovations in Latin America. In spite of all being devoted to similar questions, at least in the first three cases – focused on genetically modified organisms – the reader would not have the impression of dealing with repetitive arguments. Indeed, these three-mentioned works emphasize different aspects of this polemic topic, offering to the reader a wide range of aspects to be considered. Thus, the analyzed issues go from the importance of social participation in biotechnological debates to the role of scientific institutions in the commercialization of transgenic seeds. What they have in common is a constructivist approach, even if the reader will appreciate again differences between them. The fourth case study approaches a completely different subject: the development of ophidism in Costa Rica. The link with the rest of the papers has to do with the use of the Social Network Analysis as the basis of their explanation. This methodology has a transversal presence over the book and, actually, constitutes one of the unifying components of the edition. The second section "Análisis de redes sociotécnicas" is a powerful exercise of Social Network Analysis focused on three new cases entailing GMO controversies. Still, where the emphasis is placed differs from one another and the analyses carried out allow the reader to grasp an idea of different uses and potentialities of Social Network Analysis. Finally, the third and last section "Enfoques ESCTI de los cuerpos académicos" traces the trajectories of both Mexican partners of the research network above mentioned. Crucially, this is quite useful in order to understand the very origin of the book.

It is difficult to offer a general overview of the book, mainly because it is an edited book with different and singular contributions. Besides, the content is quite uneven and the deepness of the analyses or the very quality of the writing style varies substantially depending on the chapter. Nevertheless, it has certainly great value as an example of the vitality of research in the field of Science and Technology Studies from Latin America.

Without doubt, some of its contributions merit to be outlined. Let me mention which are, from my point of view, the most relevant ones. First, the book is an interesting and consequent application of the Social Net-

work Analysis to Science and Technology Studies. By itself, it delivers a set of case studies that will certainly be very inspiring for those interested in this methodology and its potentiality in the study of topics such as the evolution of research lines in research groups or the analysis of co-authorships as an indicator of the internationalization practices of institutions. Second, as a whole, the book offers a very complete outlook of the history and current debates regarding transgenic crops in Latin America, although specially focused on Mexico. Sometimes the reader might have the impression that authors are undertaking a descriptive task rather than an analytical one, but, in any case, it works as a conceptual map to situate relevant actors and to identify significant issues, i.e. the global food crisis, linked with the development of GMO. Finally, in its theoretical dimension, it is true that it cannot be said that there is a clear commitment with a particular theoretical option, but it is also true that Actor-Network Theory appears as a quite significant element in several chapters. In this sense, the book constitutes another example of the influence of this approach in Latin America, becoming a popular toolkit for social analysis.

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M. Audétat (ed.)

Sciences et technologies émergentes: pourquoi tant de promesses? [Emerging Sciences and Technologies: Why so many promises?], Paris, Hermann, 2015, pp. 316.

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Expectations are important. When we are faced with a person or a situation (whether known or unknown), what we expect is somehow constitutive of the relationship that we are about to establish with that person or situation. One may cite various works by Goffman in this regard, but I expect that those reading this review will find the previous sentence so obvious that it requires no further specification. This makes it possible to immediately point out another feature of expectations: that they reduce complexity and facilitate communication and representation. In both sociology and social psychology, "expectation" is commonly defined as the individual's reasonably realistic prediction about the behaviour of other members of society in a context of uncertainty. The more knowledge actors possess about social dynamics, the more they will be able to have solid and reliable expectations. The main problem therefore arises when expectations are not fulfilled.

If we move from the individual and everyday level to that of science, we realize that expectations are nothing more than assumptions that

guide research. A research hypothesis can be seen as what the researcher/s who has/have formulated it expects/expect to happen as a result of a certain event. In this case, the non-fulfilment of the expectation coincides with the non-confirmation of the hypothesis, and therefore with its reformulation.

If we then move from the level of scientific research to that of research policies, we see that expectations concern issues directly connected to forms of knowledge and inquiry believed likely to be useful in the future and generate innovation. In this case, too, non-confirmation of expectations creates problems. But unlike in the other two cases, the matter is complicated by the fact that a great deal of time (and, in a certain sense, also a great deal of "space") must pass before assessments can be made. Jean-Michel Fortin and David Currie (2013), for example, examined the scientific impact, in a certain period of time, of Canadian university researchers in three disciplines: animal biology; organic and inorganic chemistry; evolution and ecology. They demonstrated the lack of correlation between the amount of funding and scientific impact, suggesting that larger grants do not lead to more important discoveries. In other words, expectations about the results that some lines of research could have produced if properly funded were not fulfilled. Unfortunately, this necessarily happened at the expense of other lines of research, which in the same time span were not funded to the same extent because they were deemed less promising. This brings us to what is of most interest to STS (and to the text reviewed here): the promissory component inherent in scientific expectations, in their construction, and in their legitimization and institutionalization at social level.

In particular, Marc Audétat argues in the Introduction, compared to notions such as "expectations", "visions", and/or "imaginary", that of "promises" is less neutral. It highlights the ambiguity and uncertainty they carry with them and makes it possible to grasp the technoscientific regime that guides research policies. In fact, it should be clear that the "economics of technoscientific promises" has direct effects on research funding, so as to generate outright speculative bubbles (Joly, Section 1, Chapter 1), like that of ICT in the early 2000s or, more recently, bio/nanotechnologies and neuroscience. In this regard, it may be worth mentioning that the *Human Brain Project* (whose objective was to develop a mathematical model of the human brain that would lead to the development of new drugs and the possibility of curing diseases such as Parkinson's or Alzheimer's) in 2013 received a grant of 1 billion euros from the European Commission, and then gave rise to an enormous scientific controversy (Panese, Section 3, Chapter 2). Published a year and a half after approval of the project, in fact, was a letter signed by more than eight hundred European neuroscientists who criticized both the project's scientific objectives and its governance. Later, in face of the boycott threatened by the signatories, the European Commission appointed a committee of scientists in order to profoundly reorganize the project in

an attempt to remedy the most critical issues.

Nevertheless, promises are both necessary and essential in the technoscientific domain. They are necessary because they make it possible to "naturalize" technological developments, thus satisfying two contradictory demands often made of science: it must be novel and credible (Joly, Section 1, Chapter 1). Promises are essential because they enable the actors involved to legitimize their projects, mobilize resources, and stabilize their networks and contexts of action. Thus, the focus is not simply on the public understanding or public communication of science; the various chapters of the book (mostly based on case studies) embraces much more heterogeneous (and scattered) processes, such as the "marketing" of promises, their situatedness and performativity, together with the network dynamics with which they engage.

Chapters are organized into four Sections ("Economy of scientific promises and time collapses"; "The making of information technology for social promises"; "Life science dynamics and horizons of expectations"; "How to engage with promises for social sciences and humanities?"). This helps to identify the main themes clearly. Given the orientation to future (or futuristic) scenarios, most authors concentrate on some of the latest "novelties" of technoscientific domains, such as neurosciences, nanotechnologies, and biomedicine. But given the promissory nature of the results that the alliance between the social sciences and information technology may generate, they also consider Moore's Law, and the debates that have developed around big data and digital humanities. This makes the book attractive in that it offers an updated journey through all contemporary technoscientific trends, avoiding the trap of confining the promises of technoscience to the domain of natural sciences or engineering.

Moreover, to be noted is that before the book was written, it was "spoken" and discussed. The book originates from a cycle of seminars (titled "Nanopublic") started in 2008 and held at the University of Lusanne as part of the "Science-Society Interface" programme (which also demonstrates how the geographies of STS in Europe are evolving). This means that the book is internally highly coherent, and that individual chapters converse fluidly with each other and help give continuity to the ideas and arguments. Accordingly, in this review I have decided to keep references to the individual contributions to a minimum, in an attempt to convey the book's sense of unitariness. However, I cannot fail to mention (and explicitly recommend) what is for me the most challenging and to some extent "unexpected" chapter of the entire book, the one by Sara Angeli Aguiton, Emilie Bovet and Sara Tocchetti, and significantly entitled: "What kind of critical practices in the domain of scientific promises?" (Section 4, Chapter 4). Reading it reminded me of the ironic and reflexive stance taken by Sharon Traweek (1992) in "Transgressing Boundaries" to problematize the (disciplinary) processes of construction and institutionalization of knowledge, and this in order to emphasise the chapter's capacity to consult the readers and have them participate in the

discourse. It is a chapter, moreover, which provides an ironic and interesting "Malaise Bingo" of STS researchers, which consists in recognizing themselves in questions and statements such as: "Is the aim of STS to make science better?"; "The academic world is the place of social change?"; "I work with a natural science researcher who, whenever he revises an article of mine, systematically comments "I don't understand" on the epistemological passages in which I question the linear progress of his field of research".

Consistently with the attention to (and curiosity in) the construction of future scenarios in the technoscientific field, the book closes with a reflection by Arie Rip on: "The future of the regime of the promises" (Section 4, Chapter 5). Here the discussion returns to promises as integral elements of a knowledge regime (and therefore something that concerns the present more than the future) and the double linkage that ties scientific promises to research funding. In particular, Rip identifies in three current trends the most significant features of what will be the future scenarios: a) a focus on indicators, instead of the "reality of things", which gives rise to an industry of "derived products" (such as, for example, the Shanghai ranking of the best universities in the world); b) the attempt to link emerging scientific technologies and knowledge to product innovation and the absorption of these products on a social level; 3) a certain deprofessionalisation of science.

These may not be the right trends for a happy ending, but the book deserves to be read anyway.

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Boel Berner and Isabelle Dussauge (eds.)

Kön, kropp, materialitet: perspektiv från fransk genusforskning [Sex, body and materiality. French perspectives on gender studies], Lund, Arkiv, 2014, pp. 249

Silvia Bruzzone *Ecole Nationale des Ponts et Chaussées* and **Henny Stridsberg** *Université Paris 8*

The focus of this collective work is the development of gender studies as viewed through the prism of technology and natural science. The editors' intention is to show in a collection of articles how French feminist research and gender studies have contributed to our understanding of science, technology and materiality, and more broadly to the construction of knowledge, with a special focus on a so called French perspective.

The texts that make up the book are taken from a variety of disciplinary backgrounds – philosophy, anthropology, sociology, history, and biology – and were published in French-edited academic reviews or books between 1997 and 2010. In the introduction, the editors retrace the history of gender studies in France. Even though France was in the forefront in the 1970s in this field – starting with Simone de Beauvoir's crucial work – they recount the ideological and institutional resistance to the development of gender studies in France.

From an ideological point of view, the main characteristics of the second wave of feminism were its opposition to any form of intellectualization of the movement and its disconnection with the academia. The fragmentation of feminist groups and disengagement from the first wave of the 1950s were also features of the French women's movement in the 1970s. These factors prevented the development of academic research in women studies during this period.

From an institutional point of view, the clear separation among academic subject areas in France hindered the progress of the new discipline, with sociology and history proving to be more open to feminist issues. It was not until 1983, therefore, that the first Department of Gender Studies was created at CNRS, with a specialization in the sociology of work.

Gender studies have flourished in France in the last twenty years thanks to the involvement of well-known scholars such as Pierre Bourdieu and Francoise Heritier. The establishment of the Institute for Gender Studies in 2012 then brought greater acceptance for the subject. Despite this, the editors claim that gender studies in France still do not enjoy much official support, and that the educational offer and the number of professors in the sector are both still limited. More recently, moreover, objections have been raised by Catholic associations in the context of the debate on same sex marriage, adoption, and procreation practices.

The editors place the texts in this book within a third wave of feminist thinking, which since the 1990s has been characterized by an understanding of gender as social construction. As the editors explain, what these texts have in common is that they have all raised gender issues in French technology and natural science studies. As its title suggests, the book is divided into three sections: materiality, body and sex.

The main topic of the first section is how technology has contributed to the reproduction of gender power relations.

The first piece, by Delphine Gardey, focuses on the development of the typewriter as a feminine object at the beginning of the 20th century,

and shows how this process accompanied the subordination of women in office work.

Danielle Chabaud-Rychter's piece deals with the progressive "detechnicization" of technical objects and the progressive exclusion of users from their technical mechanisms. In the case of home appliances, the growing distance between design innovators and users takes the form of a greater distance between man-innovators and women-users, at the same time as design progressively embodies female practices.

Ilana Löwy shows how natural processes have been redefined by new medical techniques for assisted procreation in accordance with nation-specific values and socio-economic conditions. In France, severe State control over those techniques and the restricted access offered to heterosexual couples reinforce the "norm" that procreation is confined to young heterosexual couples. The U.S. context is very permissive in terms of permitted techniques and access for non-heterosexual individuals, but this medical sector turns out to be highly lucrative and completely regulated by the market, and so in practice, the right to assisted procreation is restricted to people with high incomes. In Israel, a specific combination of orthodox Jewish values (in particular relating to procreation) and national interests – namely the perpetuation of the Israeli State – make Israel the most liberal system in terms of low-cost access to assisted procreation.

The second part of the book deals with nature, science and medicine. It shows in particular how medical knowledge might lead to a separate new understanding of the body apart from the subject, affect access to work activity and even represent a source for moral judgment on the body.

Madeleine Akrich and Berenice Pasveer analyse the role played by medical practice in childbirth. Their main theory is that the dichotomy introduced by obstetric knowledge between a woman's body and her perception of it does not inexorably translate into a sensation of alienation from her body. Their suggestion is that we should go beyond the dualism between medical practice and the holistic approach. Some techniques used on women (such as epidurals) may allow a woman to maintain a certain link between her body and herself. This is very body- and context-specific, and from this perspective, the role of medical personnel as mediators becomes crucial, and diversification in medical practice is necessary in order to adapt to the plurality of patients.

Rossella Ghigi retraces the "invention" of cellulite as a pathology in medical discourse at the beginning of the 19th century and its appearance in women's magazines in the 1930s. The author shows how the crusade against cellulite and obesity at the time created moral condemnation of women's bodies, as it was associated with the concept of women's unhealthy bodies and the degenerate habits that are typical of modern cities.

In her analysis of the connections between female health and risks in the workplace, Anne Fellinger focuses on the nuclear research sector. The

historical evolution of this field of research - from the experiences of Marie Curie and Marguerite Perey until today - show how increasing protection of women in this area actually led to their being gradually excluded from this area of research, in which men are now over-represented.

In the last section of the book, the authors approach the discussion of biological sex differences from a variety of angles.

Nicolas Divert provides an analysis of the social mechanisms that link sexuality and education choices, showing how boys at French fashion schools are characterized as deviant in a dual sense: both sexually, because it is presumed they must be homosexual, and also with regard to their choice of profession.

Differences in height between men and women appear to be taken for granted, but what are the causes of sexual dimorphism, and why does it persist? While the evolutionist theories that are mobilized to explain, dimorphism are not appropriate to explain the phenomenon, Priscille Touraille claims that there is a certain level of resistance when it comes to investigating the social and political causes that lie at the origin of differences that are perceived as being biological. According to the author, the fact that women have historically been less well-fed than men still contributes to the persistence of a hierarchical relationship between men and women.

Finally, the philosopher Cynthia Kraus presents a complex critique of the social-constructivist approach of recent feminist theory, which has questioned the dual model that only recognizes two sexes. She suggests that social-constructivist knowledge practices deserve to be examined and problematized further.

Readers of *Tecnoscienza* will find an interesting analysis in each text of the various entanglements among gender, techniques and knowledge production. In addition, the variety of disciplinary perspectives and original fieldwork sometimes gives rise to extremely passionate research goals. The aim of the book is less convincing, however; in the end, the reader is none the wiser about what the contribution of gender studies to techniques and natural science studies from the so-called "French perspective" has been. The lack of a concluding chapter and transversal analysis compromises the editors' intent and ultimately leaves it up to the readers themselves to finding any concluding remarks. What has been proposed as a "French perspective" is not sufficiently problematized, and nor is the interest in the interaction between gender and studies on materiality. This means that the choice of articles is not clear, and in the end, the purpose of the book seems to be to suggest examples of interactions between gender and STS studies under the principal headings of "materiality", "body" and "sex" to non-Francophone readers without ever developing a discussion on disciplinary boundaries and epistemological perspectives.

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Giuseppina Pellegrino and Alessandro Mongili (eds.)
Information Infrastructure(s): Boundaries, Ecologies, Multiplicity, Cambridge, Cambridge Scholars Publishing, 2014, pp. 337

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Based on a thematic track organized in occasion of the EASST conference in Trento (September 2010), this edited volume holds a collection of fourteen chapters on Information Infrastructures and/as Boundary Objects. The book presents itself as a theoretical and empirical contribution on information infrastructures (IIs) and it is aimed at STS-ers, but also organization studies and media studies scholars.

In the very well-written and accessible "Introduction", an overview is provided of how infrastructures and boundary objects developed conceptually, how they compare to other STS concepts such immutable mobiles and what is their place within approaches like ANT and SCOT. It serves as a conceptual framework and reading lens for the book, and it works well in guiding the reader through the sometimes-confusing vocabulary of STS. Some of the main points made in the introduction are the emphasis put on the interpretation of boundary objects (BOs), their different shapes and forms (not necessarily being material things) and the interpretation of information infrastructures themselves as boundary objects. The editors explain very well the types of information infrastructures and the need to research them, and they provide a relevant take on BOs and IIs.

The editors set out three main *foci* for looking at the empirical cases and examples of IIs provided in the volume; namely, boundaries, ecologies and multiplicity. They are, they say, interlinked dimensions of IIs. These dimensions are illustrated by way of how other authors have used these terms, and thus well-explained and referenced. However, they are not very clearly defined in terms of dimensions and, as a result, the promise made to push theoretical insights by using these "dimensions" to analyse empirical material seems difficult and *ill*-structured (to use one of the labels Star used to categorize IIs – either *well*-structured or *ill*-structured). Questions of scaling up or down, of insiders/outsiders of a particular infrastructure that a (novel) technology or application instigates and of (de)centralization are connected to these dimensions and relevant when studying IIs. To what extent the insights produced in the chapters can be compared, measured and generalized in order to confirm ways of thinking about IIs or to develop novel ones, remains to be seen and does not become entirely apparent in the provided reading lens.

The "Introduction" does not delve into explaining or problematizing key terms in themselves, such as "information" or "infrastructure": what exactly makes up an information infrastructure and how to delineate an infrastructure from a thing-in-itself? Does it depend on the amount and types of users? On the fact that it is digital and/or electricity-based? Or

on some form of classification model or protocol being present or being "done"? After reading the book, the reader does get a better feel and grip on these questions, yet they are not dealt explicitly. An explicitation of these issues could have helped in sharpening even further the reading lens for the chapters.

The chapters are divided in four parts that bundle three to four chapters each under a thematic heading. The first theme deals with the design and articulation of information infrastructures (IIs). This first part aims to provide a grip on what IIs can be. The first and third chapters (respectively, by Mongili and by Klein and Schellhammer) show in-depth a well-designed study on the making of IIs, together with the processes of representation and the different types of boundary objects involved in these processes. The second chapter (by Pellegrino) tries to compare three seemingly incomparable "cases" in order to show the contingencies of IIS. Vulnerability, ductility and resilience take the stage, although the advantages of comparing these cases could have been underlined with more strength. In all three chapters, moment of disruption or the influences of external actors or processes in making visible certain problems within IIs are discussed, also by providing insights in how boundary objects "act" or categorize and (de) stabilize.

The chapters in the second part are grouped around the concepts of ecologies, by seeing IIs as ecological tools. The first chapter (by Poderi) deals with a case of open versus formal computer software development and discussed practices of Free & Open Source Software (FOSS). The empirical material is mixed and presents interesting approaches to game studies by looking at different actors and sub-parts of the game to be developed and how these forces interact (or not) during the development process. As such, it can also be seen as an empirical qualitative software studies project. The two following chapters (by Neresini and Viteritti and by Crabu) present more traditional STS-lab work, in which equipment and processes of standardization enter, and alter, the lab workplace. The one by Neresini and Viteritti is focused on the introduction of lab-KITs in order to standardize DNA analysis and on how these shape biomedical research, training, and research habits. Crabu discusses the work of externally defined protocols and the local adjustments to these protocols. The chapters present a truly mixed method approach, and they provide a clear diagrammatical analysis and good (yet sometimes over) use of thick descriptions through field notes or participant notes (just a sidenote: if one presents field notes or graphs, they should be readable or at least externally accessible). In these chapters, mostly anecdotal evidence is provided and, although methodologies are often well-explained, they are not always properly backed up (e.g. why this was the appropriate method for the job at hand). On a theoretical level, the role of ecology as a conceptual tool is not always obvious.

In Part Three the role of users is discussed, as well as their different roles and the difference of these roles in relation to specific IIs. The first

chapter (by Denis and Pontille) deals with online cartography, more specifically with a project of bottom-up and open source bike lane mapping. This very enjoyable chapter shows the negotiation of life-worlds, that of users and programmers, and how they try to "protect" or claim their expertise in the coming to being, and especially in the maintenance and in the improvement of the software. The next chapter (by Lazzer and Giardullo) compares two open-source sharing platforms for books, using an actor-network software to map how this information infrastructure actually looks like and how users and platform "owners" negotiate (again, it would have been be nice if the graphs were accessible online, and/or published in higher-resolution). The third chapter (by Mitrea) has a more theoretical nature and makes an analysis of dispositves of intelligent mobility, using – amongst other – scenario methods. The fourth (by Isabella) is about how users are defined by different groups of workers within a relevant Italian telecommunication company and about what is the role played in these definitions by the software infrastructure that mediate the relation with them.

The fourth and last part of the book focuses more on policies and discourses as boundary objects and on their role in shaping potential IIs, where organization, markets and governance issues are of key relevance. The first chapter (by Miele) applies the concept of boundaries object to organization, comparing the work of two spin-off projects. The second chapter (by Turrini) focuses on risk models in medicine. The third one (by Cozza) on the development of science parks and on the interaction between a multiplicity of visions on what a science park should be. The last chapter of the book (by Lugano) evolves around the notion of convergence and divergence in design tools and how this has a shaping effect on how digital infrastructures come into being.

The common ground to be found in all these chapters is the role of IIs in shaping and allowing/disallowing connections and relationships. Thus, the main contributing factor of the book is to show that infrastructures "do" and, therefore, are a site for research. This is not an entirely new finding so that the book should probably be interpreted as a continuation of the research agenda set out by Bowker and Star (1994).

Many chapters show highly relevant case studies that provide an insight in how to apply or "do" infrastructure research. The many chapters vary in terms of level of analysis and type and size of case, presenting a colourful spectrum of different types of STS infrastructure work.

Notwithstanding the excellent work done, some after-reading comments are required. A first one regards the fact that the work on infrastructures and on systems of ordering and classification has usually specific goals. To focus on this aspect could show or reveal a particular hegemony of one type of systems or to show alternative ways or modes of ordering that would have different consequences for how we experience an information system. If, as the book argues, we need to understand and investigate infrastructures conceptually through boundary objects, a key

starting point could have been to argue more clearly how or why the cases discussed are boundary objects and what happens at the boundaries. Such a lack could be a consequence of how authors have framed themselves in the research they have performed. The chapters presented are highly exciting in terms of the types of fieldwork and cases presented; yet most chapters adhere to the adagio of being mostly descriptive in an STS-oriented vein. Duly noting that Law (2008) once stated that the agenda of STS should remain descriptive and case-based, the book could have pushed the field of studying infrastructures from an STS perspective by framing it in a larger critical socio-political agenda. Or, to put it in terms of a later article by Law (2009), via the term "interference", by which he means that there is a way for STS scholars to "be" political without being prescriptive or without telling what is right or wrong (at least by acknowledging their own role as researchers and the effect they have on the field they are researching). "Politics is about interfering to make a difference" (Law 2009, p. 11). The arguments for what this difference is, or should be, or how studying the myriad of IIs and BOs particularly contribute to unveiling alternatives of differences, would have been an interesting addition to the introductory chapter in order to answer the question of why studying information infrastructures.

A second remark regards the impression that some chapters seem to have reinterpreted afterwards the data collected in terms of boundary objects or information infrastructures, rather than having taken these concepts as starting points of their research. As a result, whereas the book is extremely rich in terms of empirical material, theoretically it remains up to the reader to distil and connect the relevant theoretical points made in the introduction with the individual chapters.

Overall, the range of topics may be not all equally suited to inform or push conceptually on the concepts of IIs and BOs, yet they do provide a wide and attractive spectrum of cases, which are informative and show in-depth fieldwork. The book is accessible and it contributes to an empirical understanding and grounding of the notions of IIs and BOs. As such, the volume sets and fills out the agenda for this important research topic and expands it well beyond a STS scholarship only.

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TECNOSCIENZA

Italian Journal of Science & Technology Studies

Vol. 7, Nr. 2, December 2016

Cover *Velocipedia* by Gianluca Gimini

Double Special Issue – Part Two

Digital Circulation: Media, Materiality, Infrastructures

Edited By Gabriele Balbi, Alessandro Delfanti and Paolo Magaudda